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Wastewater Treatment - Cost Estimates for
Construction of Publicly Owned Facilities
1982 Needs Survey. Technical Policy and
Procedures Categories I-V

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16. Abstract (Limit: 200 words) This report provides the best estimate available of the nationwide costs of complying with the goals of the 1981 Construction Grant Amendments to the Clean Water Act. This Survey modifies and updates comprehensive cost estimates of the five previous Surveys for constructing all grant-eligible municipal treatment works needed by existing and future populations. Advance work completed during the 1982 Needs Survey will provide the foundation for linking treatment facilities with their receiving water bodies and water quality impacts as part of the 1984 Needs Survey. This is the only complete inventory of municipal treatment works (restricted to publicly-owned wastewater conveyance and treatment facilities which include sewage treatment plants, sewers, and other types of related treatment facilities. Privately-owned facilities, military installations and national parks are excluded.				
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2. Year 2000 needs		6. Major Sewer System Rehabilitation		
3. Combined Sewer Overflow (CSO)		7. Stormwater		
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1982 NEEDS SURVEY

TECHNICAL POLICY AND PROCEDURES
CATEGORIES I-V

F I N A L

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TABLE OF CONTENTS

	<u>Pages</u>
I. Background	1
II. Scope	1
III. Changes from Prior Surveys	2
IV. Responsibilities	3
V. Survey Chronology	4
VI. General Policy Guidance	11
VII. Adjustments to the 1980 Data of Record	24
VIII. EPA-1 Facility Form Instructions	26
IX. Combined Sewer Systems Worksheet	57
Appendix A - Cost Estimating Procedures	
Appendix B - Split Secondary, AWT, and AST Costs	
Appendix C - Guide to Definitions and Codes of Liquid and Sludge Treatment Processes	

LIST OF TABLES

Table A.1 - Area Multipliers Wastewater Treatment Plant Construction	A-5
Table A.2 - Sanitary Sewer Costs Total In-Place Costs Per Linear Foot	A-25
Table A.3 - Determination of Pipe Diameter	A-26
Table A.4 - Determination of Interceptor Length	A-27
Table A.5 - Area Multipliers-Sewer System Construction	A-28
Table A.6 - Sanitary Sewer Cultural Modifiers	A-30
Table A.7 - Wastewater Treatment Plant Cost Adjustment Factors	A-36
Table A.8 - Sewer and Pump Station Cost Adjustment Factors	A-37
Tables 9.1-9.12 Incremental Ratios for Categories I, IIA & IIB Split	B-4 - B-63

1982 NEEDS SURVEY
TECHNICAL POLICY AND PROCEDURES
Categories I-V

I. Background

Sections 205(a) and 516(b) of the Federal Water Pollution Control Act Amendment of 1972 and the Municipal Wastewater Treatment Construction Grant Amendments of 1981 (P.L. 92-500 and P.L. 97-117) require that the U.S. Environmental Protection Agency (EPA) provide Congress, no later than December 31, 1982, with an estimate of needed publicly-owned wastewater treatment works. The provisions of the Act have the dual purpose of obtaining a comprehensive estimate of the total cost of meeting the goals of the Act, and an inventory of existing and proposed wastewater facilities. These costs are to be estimated by State as a possible basis for the allocation of construction grant funds. The inventory is to be used as the basis of each State's five-year priority list.

In order to achieve the goals of the Act, EPA has previously undertaken the task of conducting a Survey of Needs on a facility-by-facility basis during each of the years, 1973, 1974, 1976, 1978, and 1980. The latest Survey in 1980 significantly improved and expanded the data base. The inventory and associated technical information accumulated during this latest effort will be used as the basis for updating the 1982 Survey data base. Policies, procedures, and cost estimating techniques used in past Surveys have since been subsequently reviewed, refined, and modified as appropriate to incorporate this experience gained into the current effort.

II. Scope

The 1982 Survey will involve reviewing, revising, and expanding the data base developed in the 1980 Survey where necessary to assure that all cost and technical data are up-to-date and complete.

The Survey of Needs is restricted to publicly-owned wastewater conveyance and treatment facilities, which include sewage treatment plants, sewers, grant eligible reclamation projects, and other types of related treatment facilities. The term "treatment facility" will be used in this Survey to mean all publicly-owned facilities which perform these functions. Privately-owned facilities, except for "individual" systems, even if intended to serve the general public, and federally-owned facilities such as military installations and national parks, are excluded. Costs for facilities constructed as publicly-owned potable water treatment plants for the pretreatment, retention or treatment of wastes from water purification processes are ineligible under the financial assistance grant program established by the Act and will therefore not be included in the Survey.

Needs will be reported in eight (8) Categories as follows:

- Category I - Secondary Treatment and Best Practicable Wastewater Treatment Technology
- Category IIA - Advanced Secondary Treatment (AST)
- Category IIB - Advanced Wastewater Treatment (AWT)
- Category IIIA - Infiltration/Inflow Correction
- Category IIIB - Major Sewer System Rehabilitation
- Category IVA - New Collectors and Appurtenances
- Category IVB - New Interceptors and Appurtenances
- Category V - Correction of Combined Sewer Overflows
- Category VI - Treatment and/or Control of Stormwaters

As in previous Surveys, the 1982 Survey will be accomplished with the assistance of a contractor. URS Company of Denver, Colorado has been awarded the contract for estimating needs in Categories I-VI. CH₂M Hill of Gainesville, Florida and Sage Murphy and Associates of Denver, Colorado will be working on the Survey as subcontractors to URS.

The two main purposes of performing the Survey with contractor assistance are (1) to achieve as high a degree of national consistency in the final estimates as possible through the use of uniformly applied guidelines and validation techniques; and (2) to minimize the time required of State and EPA Regional Construction Grants staff.

III. Changes from Prior Surveys (Categories I-IV)

The 1982 Needs Survey differs from prior Surveys in several major areas.

A. Reach File - The 1982 Survey will provide a link between needs and water quality and stream use impacts. This will be accomplished through the use of the River Reach File developed by EPA. The Reach File is a computerized catalogue of streams within the United States which can be used to provide access to various data bases to acquire water quality data on individual reaches. The receiving reach will be coded on the EPA-1 facility form for each municipal point discharge and combined sewer overflow. The stream use classification for the immediate reach and the limiting downstream use classification will also be reported. (See Section VIII)

B. Allowable Interceptor Quantities - In order to provide a more equitable determination of allowable interceptor needs a revised method of calculating interceptor lengths has been developed. (See Section VI, K)

C. Multiple Purpose - The 1980 Needs Survey provided separate cost estimates for wastewater treatment and conveyance facilities designed for purposes in addition to those necessary for water pollution control. These needs will not be estimated for the 1982 Survey.

D. Comprehensive Domestic Wastewater Treatment Needs - An estimate of total national needs for domestic wastewater collection and treatment initially presented in the 1980 Survey will not be provided in the 1982 Survey.

E. EPA-1 Facility Form - Several modifications have been made to the EPA-1 form used for data collection to enhance and clarify the data collected. (See Section VIII, EPA-1 Facility Form Instructions)

F. Separate State Estimate of Backlog Needs - Although separate state estimates for backlog needs have always been allowable in the Needs Survey, space has not been provided for reporting these needs on the EPA-1 facility form. In the 1982 Survey a supplemental worksheet is provided for this purpose. (See Section VIII, Item 17)

G. Application of AT Reviews - Proposed needs for advanced treatment (AT) facilities will be mitigated as recommended in the official regional and Headquarters EPA AT reviews.

IV. Responsibilities

A. General

The successful completion of the 1982 Needs Survey will depend on the timely and full cooperation of several governmental bodies and the EPA contractor. Specifically, responsible State agencies, the EPA Regional Offices, and EPA Headquarters will be required to work closely with the EPA contractor to assure that the level of comprehensiveness and completeness set as a goal of the Survey is achieved. The responsibilities of each of the organizations involved are detailed in subsequent sections of this procedural guidance document.

B. Contractor

URS, the EPA contractor responsible for the update of the 1982 Survey, will assist EPA in a review of the 1980 Survey data-of-record, as well as in the identification of all new or previously unreported needs. This effort will be accomplished only through the cooperation of State and EPA Regional Office personnel. Individual facility data files will be updated through an evaluation of the most current information. A determination will be made among the State, EPA Regional Office and URS as to which information sources most accurately reflect current facility requirements. URS will secure and verify the new information; prepare revised cost estimates and technical descriptions of the existing and proposed facilities when appropriate within the context of the 1982 Survey guidance; and coordinate the review of the updated facility data and cost estimates with State and EPA Regional Office personnel. The updated information will subsequently be entered on a new EPA-1 facility form for inclusion in the EPA data file.

C. States

Individual States will participate with URS and the EPA Regional Office in determining the most readily available sources of current facility information and the most efficient mode of operation for assisting URS in securing the necessary information. The States will be given the opportunity to review the URS estimates, and to provide further information in support of revisions which they may feel are appropriate. Independent cost estimates may be submitted by the States if they disagree with the URS/EPA estimates and the difference cannot be resolved. Each State should determine the level of effort appropriate to achieve the goals of the Survey in light of their available resources, as the type of interface with URS and the EPA Regional Office may vary considerably.

State staffs will be required to review completed batches of EPA-1 facility forms in a timely manner and to return the forms to the contractor.

D. EPA Regional Offices

The EPA Regional Offices will be the major source of current facility information, except where better data exists at the State office. This task will be increasingly important to this Survey since contractor personnel will be manually reviewing only those forms affected by change since the 1980 Survey. Regional offices will also coordinate URS interaction with State agencies, and will provide final acceptance of the cost estimates on behalf of EPA Headquarters prior to final quality control data processing of the forms.

Regional Offices will provide basic amenities to the URS staff including access to Xerox machines, access to FTS phones, and temporary work space.

V. Survey Chronology

A. Briefings

After organizational meetings with EPA Headquarters, Regional Coordinators and State representatives, URS will commence the training and orientation of participants in the program. Training will be divided into separate functions: training and briefing sessions for State and EPA personnel, and training for the URS staff.

The training and briefing sessions for State and EPA personnel will be conducted in each of the ten EPA Regional Offices. A general overview of the Survey and the method of approach will be presented and discussed; specific techniques for the conduct of the data accumulation and assimilation, and cost estimating will be explained at a level of detail commensurate with the interests of the audience.

Sessions held in each of the ten EPA Regional Offices will be open to both the Regional Survey staff and State personnel to be directly involved in the Survey activities. One meeting per Region will be scheduled with the aid of the EPA Regional Needs Coordinator, or the Project Officer, and URS. It is important that a representative of each State be present at these work sessions.

Concurrent with the EPA training and State personnel briefing, URS will commence training of all Survey staff members. The primary difference between this training program and those meetings held to provide information to the State and EPA Regional Office personnel will be the level of technical detail covered.

URS staff will receive an overview of the objectives and methods of the Survey, and detailed training in the procedures for data accumulation and assimilation, cost estimating, and completion of the EPA-1 facility form.

This procedural guidance document and subsequent supplements, if any, will be the primary texts used during the training sessions and for the conduct of the Survey.

B. Initial State and EPA Regional Office Contact

If desired, an initial contact will be made by URS with States and EPA Regional Office personnel prior to commencing the data collection effort to:

1. Review with each State the procedures which will be specifically applicable in the State. As a minimum, an understanding will be established to accomplish the following:

- (a) Establish a plan to determine which facilities will receive the major emphasis and/or will be reviewed first. This may be decided on the basis of the dollar amount of needs previously identified for the facility; expected difficulty of updating the needs and obtaining technical data; or any other logical basis. A time schedule for the entire Survey period will be established in conjunction with this plan to identify major completion milestone dates.

In general, it is recommended that all facilities within a county or a county-equivalent be considered as a unit within the time schedule constraints imposed.

- (b) Establish a basic understanding of the coordination procedures and ground rules for any URS efforts within the State, if necessary.

(c) URS will perform the Survey on the basis of information which is available. If it is jointly determined that the most accurate data sources are contained at locations other than the EPA Regional Office, appropriate arrangements will be made for their review within established time and resource constraints.

(d) Determine if the State has identified new facilities not included in the 1980 Survey, which should have been.

2. Obtain an indication from the State of the known unique conditions in each State which would cause URS/EPA needs estimates developed through the use of national cost estimating procedures to be significantly inaccurate. In this process the States will be asked to identify and substantiate any factors that will create a major impact on established cost estimating techniques (i.e. cost of comparable construction). Identification of such factors is essential so that any potential misunderstandings can be resolved by the EPA Headquarters prior to the initiation of the actual updating process. Proposed modifications to the cost estimating procedures will be reviewed by EPA Headquarters. If it is a States's intent to use other than EPA cost estimating procedures it must notify EPA and URS no later than August 1, 1981 in order to be considered for the 1982 Survey.

C. Data of Record Provision

EPA Headquarters will preprint the data-of-record for each facility included in the 1980 Survey onto the 1982 EPA-1 facility form and provide copies to URS, the EPA Regional Offices, and the States. URS will use this data as the starting point for the updating effort.

All costs reported in the 1980 Survey have been updated for inflation to January 1981 dollars.

Facility costs which were estimated using basis of estimate Code '7', EPA Cost Estimating Procedures, in the 1980 Needs Survey have been updated by an automatic process for the 1982 Survey using the latest cost curves and rules of thumb. (See Section VII) However, if further planning has been completed for these facilities since the 1980 Survey, URS will manually update those forms using cost adjustment factors (Appendix C).

All newly-identified facility requirements will be documented by completing a new EPA-1 facility form. Alterations in the data base will be accomplished by making the appropriate changes to all or part of the EPA-1 form in the shaded spaces provided under each applicable data item number or by an automated update procedure.

D. Facility Data Adjustments

The approach to the task of data collection for the 1982 Survey will be designed to ensure that the most up-to-date information is included for the inventory of municipal wastewater conveyance and treatment facilities. Through this data collection effort the groundwork will be established for estimating the actual needs for these same facilities.

Individual facility data will be reviewed by URS and adjusted as necessary to achieve consistency with the 1982 Survey policy guidance, including such items as population, flow, and effluent requirements.

To accomplish these tasks, URS will be assessing information from EPA Regional Offices data sources such as Grant Information and Control System (GICS); operation and maintenance files; National Pollutant Discharge Elimination System (NPDES) permit files; priority basin files; State effluent guidelines and Water Quality Standards; basin, area and facility plans; the results of completed AST/AWT reviews; and State and local sources agreed upon for use as provided above.

EPA will supply URS with an EPA-1 facility form for each facility included in the 1980 Survey. This form will be pre-printed with data from the 1980 Survey data bank and coupled with automated EPA-1 information will serve as the only vehicle for capturing new or more up-to-date information on the characteristics of the facilities. This form will remain in the update process until both the State and EPA Regional Office have agreed to the 1982 analysis for the facility, or until URS must submit an estimate without State and/or EPA Regional Office acceptance because of time constraints. URS will initially sort the forms for a particular State based on the mutually agreed upon plan established during initial State contact, described in Section V, B of this guidance document.

Both the NPDES file and the GICS file will be used as major data sources. All data extracted from these files will be evaluated, assimilated, and inserted under the appropriate items of the form, adjacent to the existing needs data. Where data gathered from previous Surveys appear and are in direct conflict with file data, the NPDES and GICS file data will supersede the Needs data, as appropriate, after an assessment of the most accurate information is made by URS staff.

URS will be facilitated in the above effort by the Cross-Reference Index and the Authority Summary File. This index will indicate the NPDES file number and all applicable grant awards and priority list information for each facility included in the inventory.

Data will be extracted from the NPDES permit application and the final permit itself. Among the critical data elements used to verify needs from this data source will be:

1. Population (1981 and 2000);
2. Total flow (1981 average and design);
3. Industrial flow (1981 average and design);
4. RODs (1981 average and design);
5. Suspended solids (1981 average and design);
6. Phosphorus (1981 average and design);
7. Total N (1981 average and design);
8. Other removal and requirements or limitations;
9. Treatment procedures and methods;
10. Sludge handling procedures and methods, and
11. Level of treatment required to meet existing water quality standards.

All facilities where permits were rewritten since July 1, 1979 will be examined to determine the effect of changed effluent requirements. Needs should be reported only for that level of treatment considered justified in AST/AWT reviews when completed.

Average flows and concentrations will be verified by compilation of the most recent twelve (12) months of Self-Monitoring Report data contained in the NPDES permit files.

The GICS file will be accessed to determine if any grants have been awarded since January 1, 1980. Grants awarded after January 1, 1980 for which needs were reported in the 1980 Survey will be deducted from the pre-printed needs data by the amount of needs satisfied by the grant award. However, grants awarded after December 31, 1981 will be considered to be needs and will not be deducted from the overall facility needs.

After data has been gathered from the files and recorded, an analysis of construction costs, or needs, will be conducted, followed by technical review of the consistency of the entire EPA-1 facility form. It is anticipated that several phases of form processing will be conducted within this task. Contact with cognizant parties to request additional information on which to base decisions will also be made at this time. The latter may involve telephone or letter contact, or personal visits to States or municipalities. URS will maintain suspense files of specific problem areas and information needs during this process.

Subsequent to the technical review of the facility form, a quality assurance check of the completed EPA-1 facility form will be accomplished. After the required quality assurance review is completed for each facility, the forms will be batched and copied. The size of the batches and method of distribution to the individual States for review will be determined by URS staff on the basis of a system that will maintain a continuous flow of forms throughout the Survey period, and distribution that is expeditious but ensures document accountability. One complete set of completed EPA-1 facility form copies will be sent to the State for their review. The original working form which contains the new data will be maintained in the URS Office.

When the States receive the batched sets of EPA-1 facility forms, and have reviewed each facility, they will return to URS those facility forms which are acceptable in order to permit the originals to be released for coding and keypunching. If a State disagrees with EPA/Contractor cost estimates, it will be incumbent upon the State to formally communicate those differences via the State copies of the 1982 forms submitted by URS. The State should provide substantiating documentation for those forms submitted with alternative costs. All State comments in the form review stage must be made on a facility-by-facility basis. In addition, all EPA-1 facility forms submitted for State review should be expeditiously returned to URS; a period of two weeks from receipt is considered acceptable from the standpoint of the established Survey deadlines. The signature of the responsible state agent, whether in agreement or disagreement, should appear on the returned EPA-1 facility form or batch cover sheet to indicate that the form has been reviewed.

It is emphasized that the above task is a continuing one, and that the States will be receiving copies of EPA-1 forms in batch shipments, rather than one bulk shipment, after they are processed through the URS technical and cost analysis review. This system will allow the States an extended time period in which to review the individual facility.

In three cases, facility data will be sought at the State level; (1) facilities that were not reported in the 1980 Survey; (2) facilities which were previously included in the Survey in the planning stage, and subsequently have been issued a NPDES permit or construction grant, and (3) facilities with planning under state grant programs.

The State will be requested to identify all facilities of the type described as (1) above, and will be requested to supply the most accurate and complete data available for all of the data elements listed on the EPA-1 facility form. Copies of the EPA-1 facility forms will be available to States for this purpose. In addition, a careful review and update of the available data on facilities of the type described as (2) and (3) above will be requested.

If the State does not have adequate resources available to meet these requests, URS may arrange to place one or several staff members, within established time and resource constraints, in the State offices to assist in preparing the data. The States will, however, need to cooperate at least to the extent of providing logistic support to URS staff and permitting expeditious access to the files.

When data on a new facility submitted by a State is obtained by URS, it will be reviewed for completeness and verified with the EPA Regional NPDES permit and GICS files. A previously unused authority/facility number will be assigned by URS in cooperation with the State, and the facility will automatically be added to the EPA wastewater facility data base during final processing. The EPA Regional Needs Coordinator will review the newly-identified material and provide supplemental information as available. The form will subsequently be processed through URS's system in a similar manner as all other facilities in the balance of the process.

E. EPA Regional Office and State Review

The individual facility forms that have been updated by URS will be forwarded to State offices for review in batches at frequent intervals to ensure both the continuous flow of documents and accountability. The frequency of distribution will be in accordance with a general schedule of facility review which affords an even distribution of work over the entire estimating period. This system will prevent a massive, last-minute resource commitment and identify major problems early in the review process.

On a cover sheet transmitting each batch of EPA-1 facility forms, URS will indicate the date when the State should complete its review and perform the following actions:

1. Signify review of the facility cost and technical data by one of two methods; (1) sign each EPA-1 facility form copy and transmit to URS; or (2) sign the batch cover sheet to indicate review of all facility sheets.
2. Notify URS that there is a disagreement with the data. Subsequent to this action, the appropriate steps necessary to settle the issue should be discussed with URS.

If disagreements cannot be settled with URS, the State may provide a separate estimate by returning the facility form, marked to reflect the correct data in the opinion of the State, to URS for final processing and inclusion in the 1982 Survey data bank.

This period will provide the State with an opportunity to review URS/EPA estimates before the facility data is submitted for keypunching and data processing. However, because of time constraints, URS will be able to modify estimates only during the specified batch-review period which immediately precedes data automation of that form. Therefore, action to change an estimate beyond this review period will be handled as a separate State estimate as previously discussed, in which situation the State estimate will be treated in the final December 31, 1982, Report to Congress as a separate estimate independent of the EPA estimate.

F. Data Processing and Conversion

The conversion of data contained on each EPA-1 facility form to machine-readable format will be accomplished continuously from approximately the eighth week after initiation of the data collection efforts until all data has been converted. URS is responsible for designing preliminary specifications for data entry, including all keypunching tasks. Record format and length will be determined, but will be similar to that used in the 1980 Survey. The output medium of the key-preparation operation will be nine (9) track, 1600 BPI magnetic tape.

G. Survey Close-Out

URS staff will meet with State and EPA Regional personnel to debrief the staff prior to the end of the Survey, if requested in writing.

VI. General Policy Guidance

A. General

This section sets forth major goals and policies for the conduct of the 1982 Survey and technical policies which have general applicability not necessarily related to specific data entry items on the EPA-1 facility form.

The following types of publicly-owned, wastewater conveyance and treatment facilities also will be included in the 1982 Survey, if Regional offices determine that they are grant eligible:

1. State and local municipality-owned facilities, such as those in public parks, highway rest stops, and public school systems;
2. Facilities on Indian Reservations except federally-owned and operated installations; and
3. Privately-owned facilities which will be purchased by the State or a municipality, if there is a letter of intent to purchase on file.

B. Present and Projected Population

The population base and design year for the conduct of the 1982 Survey will be the 1977 BEA year 2000 projections. State variances for which a request was received by the Regional EPA office by October 1, 1980 and approved by EPA Headquarters for use in the 1980 Survey will also be accepted.

EPA will consider requests for variances from the BEA year 2000 State population projections for those States where the 1980 Census population exceeds the BEA 1980 population projections by 4 percent or more. States which have previously received variances from the BEA year 2000 projections are ineligible for new variances.

All variance requests must be accompanied by documentation and submitted to EPA Headquarters by January 31, 1982.

The present population base is defined as the 1980 population as reported in the April 1981 Report of the Bureau of Census.

C. Design Year

Costs will be based on the design of facilities which will serve the projected year 2000 resident and non-resident population. The composite, State-wide year 2000 population figures will be distributed throughout the State as appropriate. If a plant design has been based on a year beyond the year 2000, the facility costs will be adjusted on a required flow basis to reflect the year 2000 population figures; otherwise costs will be reported based on the facility plan.

D. Water Quality Criteria

The 1982 Survey will be limited to facility requirements that are based on effluent criteria included in State water quality standards approved by EPA as of January 1, 1982. Cost estimates of facility needs also must be in accord with current municipal construction grant eligibility guidelines as specified in the September 27, 1978, EPA Construction Grant Regulations, Facilities Planning 82 (FP-82), and other legally binding requirements, including the results of AST/AWT reviews which have been completed.

Wherever reference is made to terms relating to "secondary treatment" it will be considered for the 1982 Survey to be synonymous with the term "Best Practicable Waste Treatment Technology (BPWTT)". Also, for the purposes of this Survey, BPWTT will mean secondary treatment under the treatment and discharge alternative, unless higher levels of treatment are required by EPA-approved water quality standards or other requirements.

Secondary treatment and BPWTT are defined for use in this Survey in Section VIII, EPA-1 Facility Form Instructions, of this procedural guidance document.

E. Design Flow

1. Domestic Flow

Maximum dry-weather flows per capita per day which will be allowed as acceptable values for cost-estimating purposes in the 1982 Survey are presented below. It should be noted that these flow rates are to be used only when more accurate estimates are not available. Flow values which exceed those presented must be justified on an individual case basis. The allowable flow values are intended to encompass strictly sanitary flows and are based on the cost effectiveness guidelines published in the Federal Register dated September 27, 1978. The permissible maximum per capita allowance will thus be:

Non-SMSA cities and towns with a projected design population of 5,000 or less; applicable to the resident population only:

95 gpcd

Non-SMSA cities and towns with a projected design population of between 5,000 and 10,000; applicable to the resident population only:

105 gpcd

SMSA planning areas and other non-SMSA cities with projected design populations greater than or equal to 10,000; applicable to the resident population only:

115 gpcd

All non-resident populations:

60 gpcd

The maximum flow values presented above relate to domestic flow and include an allowable factor for commercial flows and for infiltration/inflow (I/I) that is not considered excessive; i.e., that amount of I/I flow volume which is cost-effective to convey to a treatment facility and treat rather than to correct by sewer rehabilitation. In general, it is considered permissible to include up to 25 gallons per capita per day (gpcd) for non-excessive I/I flow in a sanitary sewer system; this limitation is included in the maximum flow values presented above. The flow figures used in the Survey will relate to average rather than maximum design flow. Per capita domestic/commercial flows do not, however, include industrial flow, excessive I/I, or the wet-weather component of flow in a combined sewer system. Design populations will be used in calculating per capita flow figures.

2. Industrial Flow

Industrial flows for existing facilities will be evaluated on the basis of the following criteria:

- a. Existing flows will be allowed;
- b. Future flows will be allowed to the extent that their need can be verified through letters of intent or other documentation that is considered acceptable to the EPA Regional Office under its construction grant approval policies; and
- c. Additional future flows in excess of those validated under criteria (a) and (b) above will be allowed up to a maximum of 10 percent of the validated flow; i.e., total future industrial flow = existing flow (a) + validated future flow (b) + up to 0.1 X (a + b).

Industrial flows for new facilities; i.e., not yet constructed will be allowed as the greater of the following:

- a. Ten (10) percent of the domestic design capacity of the new plant; or

b. Actual flow to the extent that the need for capacity can be verified through letters of intent or other documentation that is considered acceptable to the EPA Regional Office under its construction grant approval policies.

Industrial flows which do not meet the above criteria will require further evaluation and documentation on an individual case basis.

F. Infiltration/Inflow

Costs for non-excessive I/I; i.e., I/I which is more cost-effective to convey and treat than to eliminate, will be reported in Category I, IIA, and IIB, as appropriate. Only costs for correcting excessive I/I will be reported in Category IIIA. The correction of I/I in a combined sewer system; i.e., sewers which are designed to transport both stormwater and sanitary wastewater, will not be reported in Category IIIA. Combined sewer system needs will be reported in Category V. In addition, costs, or needs, submitted under Category IIIA will include only those related to the analysis, evaluation and correction of I/I in a separate sanitary sewer system; all sewer rehabilitation needs for other than I/I induced failures will be reported under Category IIIB.

G. Dollar Base

All costs will be reported to the nearest one thousand dollars; hundreds will be rounded utilizing the conventional procedure; i.e., digits 0 through 4 round to the lower division, and digits 5 through 9 round to the higher division. Cost figures will be entered as indicated in the following example:

Example

If:

The actual figure is: \$1,283,652,000;

Then:

The figure will be reported as: \$1,284,000.

All costs will be in current, as of January 1, 1981 dollars. Immediately before the February 1983 report to Congress, the dollar base will be brought forward to January 1983 dollars.

H. Basis of Estimate

The 1982 Survey retains the concept that the costs reported for all needs must indicate the basis by which the cost estimate was developed, and where available, provide data to support the reported needs.

An important factor in the analysis of facility data is the determination of the level of engineering work which has been performed in each case. In the updating of a facility, it will be necessary to first determine the status of the facility in the planning cycle. This will result in either a validation or a change of the "basis of estimate" code. The requirement of further analyses; e.g., whether or not an oxidation pond might be the cost-effective alternative, depends on this code. A clear determination of the stage of each facility in the planning process will avoid unnecessary effort and will improve all subsequent data analysis.

The basis for cost estimates are described below. If more than one basis is applicable, the code which represents the highest level of accuracy and confidence will be utilized. In decreasing order of confidence level, the basis of estimate codes rank as (4), (5), (6), (8), (9), (C) and (7) for new construction, and (3), (4), (2), (6), and (7) for I/I correction and Replacement and/or Rehabilitation.

Code (1) - State Certification

This code relates to certifications by a State that excessive infiltration/inflow does or does not exist. These certifications must be based on engineering studies or other information available on the sewer system before the facility planning process and must be acceptable to the EPA Regional Office. Code (1) will not be applicable as a basis of cost estimating, but merely verifies the existence or nonexistence of I/I. Code (2) - I/I Analysis Completed; Code (3) - Evaluation Survey Completed; Code (6) - Engineer/Consultant Preliminary Estimate; or Code (7) - EPA-Supplied Cost Estimating Procedures must be used in conjunction with Code (1) as a basis for the identification of needs.

Code (2) - I/I Analysis Completed

This estimate of cost is based on a documented cost analysis in a completed I/I analysis, pursuant to 40 CFR, Part 35 dated September 27, 1978. This basis of estimate code applies only to Category IIIA.

Code (3) - Evaluation Survey Completed

This estimate of cost is based on the results of a Sewer System Evaluation Survey (SSES), completed pursuant to 40 CFR, Part 35, dated September 27, 1978, and refers only to Category IIIA.

Code (4) - Engineer/Consultant Firm Estimate

This estimate of cost is based on detailed engineering work including completed Step II Plans and Specifications for Construction Grant Assistance, in accordance with the EPA Municipal Construction Grant System.

Code (5) - Cost of Previous Comparable Construction

This estimate of cost is based on the cost of a recently completed project which is similar in size, scope, and location, and for which detailed construction cost data are available.

Estimating needs by using the cost of comparable construction basis of estimate, Code (5) has been misinterpreted and consequently changed its meaning during the past three Surveys. By its original intent Code (5) should be less accurate than Code (4) (engineer/consultant firm estimate) and more accurate than Code (6) (engineer/consultant preliminary estimate). This is not always the case and EPA is committed to insuring Code (5) is used properly and consistently across the nation. In keeping with the Agency directive to enhance and update the Survey, every facility having a Code (5) will be scrutinized to insure the intent of cost of comparable is reported consistent with the final guidance.

It is EPA's intent to make Code (5) a truly comparable cost for similar projects in the same area. The following guidelines will apply:

1. Cost of comparable will be differentiated from State-developed cost estimating procedures.
2. State-developed cost procedures will be approved by EPA and will carry Code (C). Thus there will be EPA-approved (Code C) and EPA developed (Code 7) procedures.
3. Separate cost of comparable guidelines will be established for treatment plants and sewer systems.
4. The comparable plant must have PL 92-500 funding and bid sheets. Winning bid must be supplied to the contractor.
5. The plant in question must be within two incorporated cities distance from the comparable plant.
6. EPA can use another plant as comparable if one is existent.
7. Unusual or atypical features will be excluded unless it can be shown they also will be required for the new plant.
8. Rural and urban areas will be differentiated. Cost of comparable for a project within an SMSA must use a model project within that SMSA and a project outside an SMSA must use a model project outside the SMSA.

9. The size of the project (population served, pipe lengths, etc.) must be within ± 25 percent of the size of the model project.
10. The geographic and soil conditions of the project must be approximately the same as those for the model.
11. For collectors and interceptors the same distance and supporting material requirements as for treatment plants will apply.
12. If a State is unable to assign a model project for an area, then the EPA cost estimating rules will apply.
13. All hybrid costs now specifying Code (5) will be removed and another code assigned. These are situations where, as an example, a State uses footage requirements based upon one source of information and dollar costs per foot using EPA rules of thumb.
14. The basic unit of a State will not always be the minimum unit. To save time and resources, EPA requires that each State seek preliminary approval on whether the State should be divided and in what manner. These preliminary proposals must be submitted to EPA by August 1, 1981.
15. The State must notify EPA and URS of its intent to use cost of comparable by August 1, 1981. Documentation must be submitted to the contractor with the reviewed EPA-1 facility form no later than October 1, 1982, so that the work of the Survey can proceed. No further cost of comparable data will be accepted thereafter.

Code (6) - Engineer/Consultant Preliminary Estimate

This estimate of cost is based on a completed Step I or other facilities plan, in accordance with the EPA Municipal Construction Grant System, Step Program, including a cost effective analysis, or in the case of Categories IIIA and IIIB, based on a completed technical study which provides sufficient information to estimate cost eligibility and validity.

Code (7) - EPA-Supplied Cost Estimating Procedures

This basis of estimate indicates that the cost has been estimated through the use of the EPA cost estimating procedures. New cost curves have been developed for the 1982 Survey which replace all previous EPA cost curves. The EPA cost estimating procedures to be utilized in the 1982 Survey are detailed in Appendix A of this procedural guidance document.

Code (8) - Cost Effective Analysis (unapproved facilities plan)

This estimate of cost is derived from economic evaluation of an unapproved facilities plan pursuant to 40 CFR, Part 35, dated September 27, 1978.

Code (9) - Other Preliminary Estimates

This estimate of cost is derived from comparative economic evaluation of various alternatives other than an unapproved facilities plan i.e., a 208 plan estimate, a master plan or other engineering documents.

Code (A) - Grant Award Fulfills all Needs

This code will be used if a 1980 dollar need for a category has been reduced to zero due to a grant award.

Code (B) - Grant Award Fulfills Partial Needs

This code will be used where a Step III grant has been awarded but needs remain.

Code (C) - State Supplied Cost Estimating Procedures

This code will be used for State developed cost procedures which have been approved by EPA. The following guidelines will apply:

1. EPA will expect the State to collect and analyze the bid documents from PL 92-500 projects only. At least 75 percent of the funded projects applicable to the level of treatment for that State must be part of the data base. These data must be analyzed using identical statistical techniques as used in the development of the EPA cost curves, including updating procedures.
2. Lagoons will be excluded, as they use significantly different curves, many of which will be based on State design criteria.
3. All plants greater than 2.0 MGD will be excluded unless large amounts of data are available.
4. A minimum of five plants of any level of treatment must make up the data base and the regression coefficient must be greater than 0.75.
5. EPA must be supplied with the data and analytical procedures in sufficient detail to confirm the results.

6. For collectors and interceptors basically the same rules apply except the statistics apply to individual pipe sizes, not projects.

7. Because of the extensive data base on construction costs available to EPA, any State developed procedures which exceed EPA adjusted values by more than 20 percent will be closely examined by the Agency and its contractors' engineering staffs.

8. If a State intends to develop its own cost estimating techniques, it must notify EPA and provide preliminary procedures by August 1, 1981. Final State procedures must be submitted to EPA by October 1, 1981.

I. Two-Thirds Rule for New Collector Sewers

Section 211 of P.L. 95-217 states that as a condition of construction grant eligibility, a sewage collection system must be "... a new collection system in an existing community ...". The Title II regulation (35.925-13) states that "A community ... would include any area with substantial human habitation on October 18, 1972". Further clarification of grant eligibilities is provided in FP 82. No grant award may therefore be made for a new sewer system in a community in existence on October 18, 1972 unless it is further determined by the EPA Regional Administrator that the bulk, generally two-thirds, of the flow design capacity through the sewer system will be for wastewater originating from the inhabited community in existence on October 18, 1972.

The purpose of the above regulation is to preclude the possibility that the grants program will be used to sewer areas which were uninhabited at the time P.L. 92-500 was passed into law. These areas include new subdivisions and/or new housing complexes which must provide for installation of a waste collection system at the time of development.

For the purposes of Category IVA in the 1982 Survey, the regulations have been interpreted to apply directly to population; i.e., at least two-thirds (2/3) of the population for which new collector sewers are required must have existed in the community on October 18, 1972.

Items 18, 24, and 25 on the EPA-1 facility form will be used to determine Category IVA eligibility. If Item 24 is answered "NO", no Category IVA needs will be permissible. Therefore, Item 24 must be answered "YES" if Category IVA needs are anticipated. Item 25, the 1972 population for which new collector sewers are required, must also be greater than zero for Category IVA needs to be permissible. It should be noted that the population entered in Item 25 cannot exceed the population "not receiving collection" entered in Item 18a(4). Also, the October 18, 1972 population not receiving collection services, as entered in the 1982 Survey, cannot increase except when the service area covered by a collection facility is enlarged to encompass population not accounted for on another facility form.

The population entered in Item 25 represents 2/3 of the maximum population eligible to receive funding for new collector sewers. Therefore, populations of up to 150 percent of the Item 25 population will be eligible for new collector sewers provided this population does not exceed the anticipated growth in population which will require collection services by the year 2000. This growth population will be determined by subtracting the Item 18a (3) population from the Item 18c (3) population on the EPA-1 facility form. This rule applies only to the 2000 estimate. Backlog estimates for Category IVA will be based on the Item 25 population.

Two examples of the determination of the eligible population for calculation of Category IVA needs are presented on the following page for illustrative purposes:

Example

If:

Present resident population receiving collection:	6,000
Present resident population not receiving collection:	<u>800</u>
Total present resident population:	6,800
Projected resident population receiving collection:	7,000
Item 25: 1972 resident population not receiving collection:	600

Then:

Eligible collection population = $1.5 \times 600 = 900$;

Growth population = $7,000 - 6,000 = 1,000$;

And:

Eligible collection population = 900; 1000 = growth population;

Therefore:

Category IVA needs are allowable for up to 900 persons.

Example

If:

Present resident population receiving collection:	6,000
Present resident population not receiving collection:	<u>17,000</u>
Total present resident population:	23,000
Projected resident population receiving collection:	14,000
Item 25: 1972 resident population not receiving collection:	8,000

Then:

Eligible collection population = $1.5 \times 8,000 = 12,000$;

Growth population = $14,000 - 6,000 = 8,000$;

But:

Growth population = 8,000;

Eligible collection population = 12,000

Therefore:

Category IVA needs are allowable for up to 8,000 persons.

J. Allowable Collector and Interceptor Quantities

Rules of thumb have been developed for determining appropriate collector and interceptor lengths based on population, when more substantive data is lacking. These rules of thumb have been developed utilizing 1972 unsewered; i.e., not receiving collection, and present and projected sewer populations. For each calculation the applicable population must be derived by using either the sewer growth population, consisting of the population difference between Items 18a (3) and 18c (3) on the EPA-1 facility form, or 150 percent of the 1972 unsewered population entered in Item 25, whichever is less.

The rules of thumb for pipes to be applied in the 1982 Survey are:

1. For collectors, sixteen (16) feet per person and less will be acceptable without question. Per capita ratios greater than 16 feet per person will be allowed only in cases where justified by valid information on the municipality to be served by the proposed collector sewers.

2. In order to provide a more equitable method of determining interceptor needs for communities where no actual engineering has been accomplished, interceptor length will be determined by the area served.

By definition, an interceptor sewer extends from the end of a collection system to a treatment facility. This implies that an interceptor must be capable of transporting all the flow generated by the population in a drainage area. This also implies that, for the ideal situation, only one length of sewer in an entire sewerage system should be considered an interceptor. Since the "rule-of-thumb" estimating procedures are only used for communities that lack actual planning, an ideal situation must be assumed.

In an ideal community all the dwelling units would be evenly distributed. The topography would allow all dwellings to be served by one drainage area. For this situation one interceptor extending through the center of the drainage area would be capable of serving the whole community. The length of the interceptor would be a direct function of the area served.

For a community where no information is available, other than the population, the area of the town can be estimated by applying equations that relate population to population density. After the population density is determined the area involved can be estimated. Once an area is estimated the bisector of the area can be used to approximate the length of interceptor required.

To illustrate how the method would be applied, consider a town with a projected 2000 service area population of 10,000 people. By applying the equation $y = 2.14 x^{0.32} + 0.47$ (y = population density, people/acre and x = population, thousands), the population density is estimated to be 5.0 people/acre. By dividing 10,000 people by 5.0 people per acre the area of the community is estimated to be 2,000 acres. If the town is assumed to be circular, the diameter would be 10,572 feet. The interceptor length needed would be estimated as 2/3 of the diameter or 7,048 feet. The pipe size would be determined by multiplying the population served by 105 gpcd and finding an appropriate size pipe to handle an average daily flow of 1.05 MGD. An 18-inch pipe would be sufficient to handle an average flow of 1.05 MGD with an allowance for peak flow conditions. The interceptor length would be estimated as 2/3 of the town's diameter instead of the entire diameter because the amount of flow generated in the upper reach of the drainage area would be too low to justify an 18-inch interceptor.

If only 5,000 people in this community required sewers, the interceptor length would be determined by applying the ratio of 5,000 to 10,000 to the length required for a population of 10,000. This would result in 3,524 feet of 15-inch interceptor.

Since this method assumes ideal conditions exist in all communities no pump station allowances would be made. If sufficient information is available about a particular town to refute the assumption of ideal conditions, then the estimator should not be using rule-of-thumb methods.

Refer to the Appendix A when calculating allowable interceptor lengths.

3. Growth population, for the purposes of the Survey in Category IVB, is defined as the total projected resident population receiving collection, (Item 18c(3)) minus (-) the total present resident population, (Item 18a(3)).

4. For a case in which a regional plant under one authority and a collection system under a separate authority, or authorities, exist, trunk sewer costs associated with the treatment plant will be allowed. However, since the regional treatment plant is entered as a separate facility, no population figures linked to the trunk interceptor costs will be entered.

In a situation similar to the one above, with a regional plant and a collection system(s) under separate authorities, unsubstantiated Category IV costs, determined in accordance with Item 18, may be necessary. If the precise distribution of these costs among the individual collection systems is not possible due to insufficient information, the Category IV costs will be distributed on a proportional basis developed by the URS regional review staff.

K. Plant Abandonment

The appropriate coding conventions to be utilized on the EPA-1 facility form to expedite the proper reporting of treatment plant abandonments where the associated collection system is not abandoned are as follows:

1. If the treatment plant and the associated collection system are reported on separate EPA-1 facility forms, the plant will be reported as abandoned by the use of the abandonment code in Item 16d, with an abandonment date in Item 16f.

2. If the treatment plant and the associated collection system are reported on the same EPA-1 facility form, the following procedures will be utilized:

- (a) Code Item 16(c) as (4)
- (b) Code Item 16 (d) as (9)
- (c) Enter the plant abandonment date in Item 16(f);
- (d) Reduce the projected treatment populations to zero;
- (e) Item 29(c) - Projected Design should be left blank to reflect no treatment
- (f) Effluent and Influent concentrations in Items 29(h) and 29(j) should be left blank to reflect no treatment.

L. Facilities with "Zero" Needs

If a facility requires "zero" needs as a result of the 1982 Survey, the EPA-1 facility form will require the same degree of attention for all entry items as those which indicate needs. It is of particular significance that flows, types of treatment plants and processes, effluent qualities and types of discharge be as accurate as possible on all facilities forms in order to develop a comprehensive inventory of all municipal systems for inclusion in the EPA data base.

M. Facility Deletion

On occasion, an entire facility will require deletion from the Survey, and thus the EPA data file. For example, water treatment plants may have erroneously been included in the 1980 Survey, or a plant for a regional plant may have been abandoned. For these facilities, the word "DELETE" will be printed in large letters across the EPA-1 facility form. No additional data will be validated for the facility; however, the facility form will follow the same form review and process procedure as any other form.

N. Deletion Code

If a data item on an EPA-1 facility form must be altered from a non-blank value to a blank value, a single pound sign (#) will be entered in the shaded portion of the field containing the data. A zero will not be used for this purpose since it is considered a valid numeric value.

O. Units of Measurement

Most data will be collected in English units of measurements; e.g., feet, inches, and gallons. The data will subsequently be converted through the use of a computer program in order to generate either metric or English units, or both, for presentation in the Report to Congress.

VII Adjustments to the 1980 Data of Record

A. General

As a starting point for the 1982 Needs Survey, the data collected in 1980 will be sent to the contractor, Regional and State offices. As in prior surveys, the cost data has been inflated. For purposes of the 1982 Survey, the costs have been inflated to January 1981 dollars.

Additionally, in an attempt to reduce the field work for the 1982 Survey, several adjustments have been made to the print-out-of-record automatically by computer. These adjustments apply only to those facilities reported in 1980 using bases of estimate code "7", EPA supplied Cost Estimating Procedures. The adjustments reflect the EPA/State Needs Survey Working Group recommendations and the new cost guidance.

B. Changes for Inflation

The entire cost data base has been updated to January, 1981 dollars, which will be used as the standard reporting date for the 1982 Survey. Those costs reported under all bases of estimate except "EPA Supplied Cost Estimating Procedures" were increased for treatment by 6.38 percent for plants less than 15 MGD and 6.9 percent for plants greater than or equal to 15 MGD. Costs were increased by 5.88 percent for sewers. Cost estimates made using the EPA curves in 1980 were fitted to the new curves, which are in January 1981 dollars as well.

C. Fitting the New Cost Curves

As usual, EPA has collected the most recent historical construction cost data available to produce simplified cost curves for use in the Needs Survey when no better cost estimates are available. In the past, the field staff manually fitted the new curves to those applicable facilities. In preparation for the 1982 survey, EPA has performed that step automatically using a computer. The procedure was as follows:

1. Treatment

Each Code "7" estimate was examined. Others were ignored. From a determination of the nature and status of the facility and the nature of the proposed changes, the appropriate EPA curves were fitted and the new cost estimates replaced the 1980 estimate. Some facilities could not be updated in this manner because of anomalies in reporting on the EPA-1 form. In these cases, the costs were not adjusted. A list of the facilities which were not fitted to the new curves has been supplied to the contractor, so that this can be done manually.

2. Category IV

The hacking costs for Category IVA were reduced proportionally by population to reflect only the needs of the 1972 population.

D. Split of Category II

Because of requirements imposed by the Congress, a new requirement of the 1980 Survey was to report incremental costs for treatment above secondary. In the past, Category I was used to report costs for facilities which only required secondary treatment levels. Category II was used to report facilities that had required treatment levels above secondary. Thus, Category II estimates contained the costs required to bring those facilities both to secondary levels and beyond. To facilitate more accurate reporting, the rules of the survey were modified slightly in 1980 to allow reporting of all needs required to achieve secondary treatment levels in Category I, all incremental costs to achieve advanced secondary levels in Category IIA, and incremental costs above AST (i.e. AWT) needs in Category IIB. An AWT plant, therefore, may have estimates in all three categories in 1982.

VIII. EPA-1 FACILITY FORM INSTRUCTIONS

General

The instructions detailed in the subsequent sections of this document relate to specific items on the EPA-1 facility form, graphically depicted on pages 27 and 28. The individual item descriptions include an expansion of the General Policy Guidance discussed in Section VI of this procedural guidance document.

Item 1 - State/Authority/Facility Number

In this Survey, every existing and proposed facility is uniquely identified by a combined authority and facility number. The first two digits of the authority number are the Federal Information Processing Standard (FIPS-5) codes for States and Territories of the United States. The next four-number group uniquely identifies each authority within the State; the last three-number group identifies individual facilities within the authority.

In past Surveys, authority numbers were assigned sequentially by each State agency, using whatever consistent system was most convenient; e.g., alphabetical, geographical, or at random. For example, the first authority number in Alabama was designated 01-0001. Facility numbers were ordinarily assigned by each authority unless the State agency maintained a complete inventory of all facilities operated by each authority and pre-numbered all questionnaires.

The 1982 Survey will provide EPA-1 facility forms with data-of-record information for all facilities reported in 1980; the authority/facility numbers cannot be changed for these facilities. The contractor, in cooperation with the State, will be responsible for assigning new authority and facility numbers for new authorities, new facilities, and facilities not reported in the 1980 Survey. The contractor will work with the State agency in assigning new authority numbers to ensure that no numbers are duplicated and that the numbering system remains consistent with the existing State system, if applicable. Authority/facility numbers for facilities included in previous Surveys which have since been deleted, will not be reused.

Item 2 - Facility Name

In this Survey, a treatment facility will usually consist of a wastewater treatment plant and all associated collector and interceptor sewers, pumping stations, or other auxiliary facilities which feed into the plant and are under the control of the same treatment authority that operates the treatment plant. Therefore, in most cases, a treatment facility will consist of an entire wastewater treatment system, and only one Survey form will be completed, no matter how elaborate the system. Separate forms for each collector sewer, pumping station, or other related appurtenant structure, whether existing or proposed, will not be required, except as specified in the following paragraphs.

ENVIRONMENTAL PROTECTION AGENCY ESTIMATE OF MUNICIPAL WASTE WATER TREATMENT FACILITY REQUIREMENTS

1. Agency Name: _____
 2. Facility Name: _____
 3. Address: _____
 4. City: _____ State: _____ Zip: _____

5. Date of Report: _____
 6. Prepared by: _____
 7. Reviewed by: _____
 8. Approved by: _____

9. Date of Report: _____
 10. Prepared by: _____
 11. Reviewed by: _____
 12. Approved by: _____

13. Facility Name: _____
 14. Address: _____
 15. City: _____ State: _____ Zip: _____

16. Facility Name: _____
 17. Address: _____
 18. City: _____ State: _____ Zip: _____

19. Facility Name: _____
 20. Address: _____
 21. City: _____ State: _____ Zip: _____

22. Facility Name: _____
 23. Address: _____
 24. City: _____ State: _____ Zip: _____

1. FACILITY NAME		2. FACILITY ADDRESS		3. FACILITY CITY		4. FACILITY STATE		5. FACILITY ZIP		6. FACILITY PHONE		7. FACILITY FAX		8. FACILITY E-MAIL		9. FACILITY WEBSITE		10. FACILITY URL		11. FACILITY ICD		12. FACILITY SIC		13. FACILITY NAICS		14. FACILITY FIC		15. FACILITY FIC		16. FACILITY FIC		17. FACILITY FIC		18. FACILITY FIC		19. FACILITY FIC		20. FACILITY FIC		21. FACILITY FIC		22. FACILITY FIC		23. FACILITY FIC		24. FACILITY FIC		25. FACILITY FIC		26. FACILITY FIC		27. FACILITY FIC		28. FACILITY FIC		29. FACILITY FIC		30. FACILITY FIC		31. FACILITY FIC		32. FACILITY FIC		33. FACILITY FIC		34. FACILITY FIC		35. FACILITY FIC		36. FACILITY FIC		37. FACILITY FIC		38. FACILITY FIC		39. FACILITY FIC		40. FACILITY FIC		41. FACILITY FIC		42. FACILITY FIC		43. FACILITY FIC		44. FACILITY FIC		45. FACILITY FIC		46. FACILITY FIC		47. FACILITY FIC		48. FACILITY FIC		49. FACILITY FIC		50. FACILITY FIC		51. FACILITY FIC		52. FACILITY FIC		53. FACILITY FIC		54. FACILITY FIC		55. FACILITY FIC		56. FACILITY FIC		57. FACILITY FIC		58. FACILITY FIC		59. FACILITY FIC		60. FACILITY FIC		61. FACILITY FIC		62. FACILITY FIC		63. FACILITY FIC		64. FACILITY FIC		65. FACILITY FIC		66. FACILITY FIC		67. FACILITY FIC		68. FACILITY FIC		69. FACILITY FIC		70. FACILITY FIC		71. FACILITY FIC		72. FACILITY FIC		73. FACILITY FIC		74. FACILITY FIC		75. FACILITY FIC		76. FACILITY FIC		77. FACILITY FIC		78. FACILITY FIC		79. FACILITY FIC		80. FACILITY FIC		81. FACILITY FIC		82. FACILITY FIC		83. FACILITY FIC		84. FACILITY FIC		85. FACILITY FIC		86. FACILITY FIC		87. FACILITY FIC		88. FACILITY FIC		89. FACILITY FIC		90. FACILITY FIC		91. FACILITY FIC		92. FACILITY FIC		93. FACILITY FIC		94. FACILITY FIC		95. FACILITY FIC		96. FACILITY FIC		97. FACILITY FIC		98. FACILITY FIC		99. FACILITY FIC		100. FACILITY FIC	
1. FACILITY NAME		2. FACILITY ADDRESS		3. FACILITY CITY		4. FACILITY STATE		5. FACILITY ZIP		6. FACILITY PHONE		7. FACILITY FAX		8. FACILITY E-MAIL		9. FACILITY WEBSITE		10. FACILITY URL		11. FACILITY ICD		12. FACILITY SIC		13. FACILITY NAICS		14. FACILITY FIC		15. FACILITY FIC		16. FACILITY FIC		17. FACILITY FIC		18. FACILITY FIC		19. FACILITY FIC		20. FACILITY FIC		21. FACILITY FIC		22. FACILITY FIC		23. FACILITY FIC		24. FACILITY FIC		25. FACILITY FIC		26. FACILITY FIC		27. FACILITY FIC		28. FACILITY FIC		29. FACILITY FIC		30. FACILITY FIC		31. FACILITY FIC		32. FACILITY FIC		33. FACILITY FIC		34. FACILITY FIC		35. FACILITY FIC		36. FACILITY FIC		37. FACILITY FIC		38. FACILITY FIC		39. FACILITY FIC		40. FACILITY FIC		41. FACILITY FIC		42. FACILITY FIC		43. FACILITY FIC		44. FACILITY FIC		45. FACILITY FIC		46. FACILITY FIC		47. FACILITY FIC		48. FACILITY FIC		49. FACILITY FIC		50. FACILITY FIC		51. FACILITY FIC		52. FACILITY FIC		53. FACILITY FIC		54. FACILITY FIC		55. FACILITY FIC		56. FACILITY FIC		57. FACILITY FIC		58. FACILITY FIC		59. FACILITY FIC		60. FACILITY FIC		61. FACILITY FIC		62. FACILITY FIC		63. FACILITY FIC		64. FACILITY FIC		65. FACILITY FIC		66. FACILITY FIC		67. FACILITY FIC		68. FACILITY FIC		69. FACILITY FIC		70. FACILITY FIC		71. FACILITY FIC		72. FACILITY FIC		73. FACILITY FIC		74. FACILITY FIC		75. FACILITY FIC		76. FACILITY FIC		77. FACILITY FIC		78. FACILITY FIC		79. FACILITY FIC		80. FACILITY FIC		81. FACILITY FIC		82. FACILITY FIC		83. FACILITY FIC		84. FACILITY FIC		85. FACILITY FIC		86. FACILITY FIC		87. FACILITY FIC		88. FACILITY FIC		89. FACILITY FIC		90. FACILITY FIC		91. FACILITY FIC		92. FACILITY FIC		93. FACILITY FIC		94. FACILITY FIC		95. FACILITY FIC		96. FACILITY FIC		97. FACILITY FIC		98. FACILITY FIC		99. FACILITY FIC		100. FACILITY FIC	

NOTE - Indicate revised figures in appropriate shaded areas.

Authority and facility number

CODE REFERENCE CHART

Item	Code	Reference	Comments
1	1	1	1
2	2	2	2
3	3	3	3
4	4	4	4
5	5	5	5
6	6	6	6
7	7	7	7
8	8	8	8
9	9	9	9
10	10	10	10
11	11	11	11
12	12	12	12
13	13	13	13
14	14	14	14
15	15	15	15
16	16	16	16
17	17	17	17
18	18	18	18
19	19	19	19
20	20	20	20
21	21	21	21
22	22	22	22
23	23	23	23
24	24	24	24
25	25	25	25
26	26	26	26
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Occasionally, a treatment authority operates only a sewage treatment plant; another authority is responsible for collection and transmission. In this case, one EPA-1 facility form will be completed for the treatment plant only; a second form will be completed for the collection and transmission system only. If a single authority has control over more than one facility, an EPA-1 facility form will be completed for each facility.

The facility name for a new facility will be the name most frequently used by the authority to identify that facility. The name appearing in the data-of-record for facilities reported in the 1980 Survey will not be changed unless considered inappropriate. Standardized abbreviations will be used as necessary to include the full facility name.

Item 3 - Authority Name

The official name of the authority will be the name which is used to legally identify it. If several such names exist, the name contained in the most recent federal construction grant will be used, if still appropriate. If the authority is a unit of a city or county, the unit will be identified. For example, an authority would be described as "AUCKLAND, CITY OF, SAN. DEPT." rather than "AUCKLAND" or "LANCASTER COUNTY." (See Standardized List)

For purposes of this Survey, an authority will be defined to mean any unit of a State, county, or city government, or any other non-federal unit of government, which is responsible for the collection and/or treatment of municipal wastewater. An authority may be a unit of local government, such as the Department of Public Works of a particular city, or it may be a special-purpose agency established to provide services to a particular area, such as a metropolitan sewer and water authority. The area served by an authority may be limited to a town or part of a single city or county; or it may include all or part of a number of cities, towns, counties, or other places.

In some areas, there may be an authority responsible for the collection of wastewater and another authority responsible for treatment. In such cases, a form will be submitted describing the respective functions and eligible needs within the scope of this Survey for each separate facility and authority. Only those pertinent sections of the EPA-1 facility form relevant to either the treatment or collection will be completed for an authority which is only responsible for one service.

In other areas, no unit of government may have been designated as responsible for either the collection or the treatment of wastewater since not all areas of the country require such services. If the State agency has determined that the concentrations of population and other sources of pollution in a particular county do not require local sewage services, no EPA-1 facility forms will be completed for such counties. However, it is considered necessary that all places with a population of greater than 500 persons be represented in this Survey. States, at their option, may provide completed EPA-1 facility forms for places with populations less than 500.

For areas where there is a demonstrated need for collection and/or treatment services, but no unit of government has been designated as responsible for providing such services, the following guidelines will apply:

1. If the area is incorporated, the government of the appropriate place will be considered to be the treatment authority.
2. If the area is not incorporated, an agency of the county government, such as the Board of County Supervisors, is presumed to be the responsible treatment authority.

State Water Pollution Control agencies may have modified the above guidelines for determining treatment authorities if State law provides for a different residual responsibility, or, in New England and Alaska, for example, where the township or borough constitutes the unit of local government which serves as a county-equivalent. These variances will be discussed between the States and the Contractor during the initial contact meetings.

Item 4 - Zip Code

Enter the official U.S. Post Office zip code for the facility location.

Item 5 - Submission Code

The submission code is a one-digit number which reflects the status of the submission of the particular EPA-1 facility form, and is required for form processing control. The proper code will be indicated as follows:

CODE

DESCRIPTION

- (1) No change from the 1980 data-of-record.
- (2) Facility not reported in 1980. This may include any newly-identified facility requirement; e.g., a regional treatment plant proposed since the 1980 Survey.
- (3) Change from 1980.

Changes in the 1980 cost data, occurring from such causes as the imposition of additional effluent limitations; designation of water quality limited stream segments; or receipt of a grant award for a previously-reported need will be reported as a change from 1980. These causes may result in an increase, decrease, or deletion of a 1980 need-of-record pre-printed on the EPA-1 facility form.

Item 6 - Stream Use

The State designated stream use classification for each stream receiving a municipal wastewater discharge will be indicated in Item 6. Each state has developed a stream use classification system, which will be matched to the Needs Survey generalized stream use categories. When the State classifications are more detailed than the general Needs Survey categories, reference to the State's intent will assist the matching. The purpose of the Needs Survey is to identify the State's intended use; the individual state numeric water quality criteria will not be represented by the EPA-1 code in any way. The contractor will ask each State to review and approve the proposed matching procedure.

Some States combine several general stream uses into one stream use classification. In such a case, space is available on the EPA-1 form for a maximum of three general stream use codes. In addition to the generic stream uses, a seasonal use option under the aquatic, fish, and wildlife support and the recreation categories can be indicated. In many States, a stream use may vary during the year for a given stream segment.

When matching the State classification to the receiving stream reach as delineated in the River Reach File, the case may arise where two or more stream uses coincide in one reach. If so, the most limiting or stringent of the State classifications will be coded.

The Needs Survey code for stream use classification follows:

- 01 - Aquatic, Fish and Wildlife Support
 - 03 - Warm Water
 - 06 - Cold Water
 - 08 - Shellfish protection
 - 09 - Seasonal
- 10 - Raw domestic water supply
- 20 - Agricultural
- 30 - Industrial
- 40 - Recreation
 - 42 - Full body contact
 - 44 - Partial body contact
 - 46 - Non-contact
 - 49 - Seasonal
- 50 - Navigation
- 60 - Other
- 70 - Nondegradation

EXAMPLES:

<u>State System</u>	<u>EPA-1 Coding</u>
1. For classification XX, intended uses are: (1) Support native fish species (2) Domestic and industrial water supply (3) Secondary recreation	01, 10, 44 - -

2. Classification YY, intended uses are: 09, 42
(1) Fish and Wildlife support, Nov-April
(2) Contact recreation, May-Oct

Item 7 - Eligibility

Farmers Home

The U.S. Farmer's Home Administration (FmHA) provides grants for certain treatment facilities serving a community with a population under 10,000. Whether or not the facility is eligible for a FmHA grant will be indicated by entering "YES" or "NO" in Item 7.

PL 92-500

If funding for the facility has been provided under PL 92-500 code "Y" or "NO" in the space provided.

Pretreatment

If pretreatment of industrial flow into municipal discharges is required code "Y" or "NO" in the space provided.

Item 8 - NPDES Number

The National Pollutant Discharge Elimination System (NPDES) permit number applicable to the facility will be entered in Item 8. In some cases the data-of-record will indicate the NPDES application number; this datum will be corrected if a permit has been issued. If several discharge permits are applicable to the same facility, the permit for the major discharge pipe will be entered.

Item 9 - County Number

This will be the FIPS-6 numeric code which indicates the county in which the facility is physically located.

Item 10 - SMSA

If a facility is located within a Standard Metropolitan Statistical Area (SMSA), the identifying number of the SMSA will be entered by the Contractor in Item 10. If the facility is located outside of any SMSA, the word "NO" will be entered in the space provided.

Item 11 - Reach Number

The receiving stream reach segment will be identified for each municipal point discharge represented by an EPA-1 form. Proposed facilities, which have both needs estimated by the EPA rule of thumb procedures (Code 7) and a design capacity less than 0.1 MGD will be exempted.

The Needs Survey contractor will identify the stream reach segment in Item 11 on the EPA-1 form during the general update of the form prior to State and Regional EPA review.

The Reach File contains the names and digitized traces of streams, lake perimeters, coastlines, and basin boundaries in a branching pattern. Each reach segment number has 11 digits. The first eight have been defined by the Office of Water Data Coordination of the U.S. Geological Survey and the U.S. Water Resources Council. These first digits represent the cataloguing units arranged within accounting units which in turn fall within hydrologic subregions and regions. The remaining three digits represent the actual stream segment and were developed by the EPA. There are 60,000 stream reaches in the 48 contiguous states.

The base maps used for the creation of the digitized traces were the hydrologic plots based on NOAA Sectional Aeronautical Charts with a scale of 1 : 500,000.

A directory to the file which is now under development will consist of a book of base maps cross-referenced to tabular listings of reaches in hydrological and alphabetical order within basins and States. It will be completed in draft form and distributed to States, EPA Regions, and other agencies in the next several months. The directory will serve as a gazetteer of those streams shown on the base maps and will provide a standardized set of stream names and unique reach identifiers for all streams in the file.

Item 12 - Congressional District

The number of the Congressional District(s) to which the facility provides service will be entered in Item 12. A maximum of one congressional district will be entered. If the facility serves more than one congressional district, the largest district provided service will be entered on the EPA-1 facility form.

Item 13 - Comment Codes

During the course of previous Surveys, it was discovered that several comments on the back of the EPA-1 facility form were used consistently and repeatedly throughout the country to expand on necessary items. Therefore, these comments have been coded and added to the 1982 EPA-1 facility form; the applicable comments, if any, will be entered in Item 13 utilizing the appropriate code convention as described below. In an instance in which a comment code of "0" is entered in Item 13, a descriptive comment will be entered on the reverse side of the EPA-1 facility form detailing the applicable items.

<u>Code</u>	<u>Description</u>
(1)	Excessive I/I which is cost effective to treat.
(2)	Package plant for which the exact required capacity is not available.

- (3) Existing plant which presently has excess capacity sufficient to treat the year 2000 population.
- (4) No complete sludge handling since sludge is transported to another facility for final disposal.
- (5) Receives flow from other municipal facility (ies).
- (6) Flow diverted to other municipal facility (ies).
- (7) Receives flow from other non-municipal facility (ies).
- (8) Flow diverted to other non-municipal facility (ies).
- (9) Serves inner city
- (0) Additional comments on form
- (A) Category IVA needs required by public health officials.

Comments other than these standards will be entered on the reverse side of the EPA-1 facility form as appropriate, with a code (0) inserted in Item 13.

Item 14 - City

The name of the city or town in which the facility is physically located will be entered in Item 14. Descriptive terms such as "city of" or "town of" will not be included unless they are an integral part of the town name, such as "New York City".

Item 15 - County Name

The name of the county or county-equivalent in which the facility is physically located will be entered in Item 15.

Item 16a - Facility Status

The proper code relative to the operational status of the facility as of January 1, 1982 will be entered in Item 16(a) utilizing the following codes:

<u>Codes</u>	<u>Description</u>
(1)	In operation.
(2)	Not in operation.

Item 16b - Nature of Facility -- Present

The proper code indicating the existing type of facility will be entered in Item 16(b) utilizing the following codes: Note that if the plant is an interim treatment plant, it will be coded alphabetically rather than numerically. An interim treatment plant is a plant which will be constructed and later abandoned i.e. in a regionalization scheme.

<u>Code</u>	<u>Description</u>
(1)	A complete wastewater treatment system, including a treatment plant, associated collector and/or interceptor sewers, and methods for disposal of effluent and sludge, under the control of the same treatment authority, with <u>combined sewers</u> . (Code "A" for interim treatment plant.)
(2)	A complete wastewater treatment system, including a treatment plant, associated collector and/or interceptor sewers, and methods for disposal of effluent and sludge, under the control of the same treatment authority, with <u>separate sewers</u> . (Code "B" for interim treatment plant.)
(3)	A separate treatment plant. The sewers which discharge to this plant are under the control of one or more different authorities. (Code "C" for interim treatment plant.)
(4)	A <u>separate municipal wastewater collection system</u> . This system would include one or more connected collector and/or interceptor sewers, force mains and pumping stations, which either discharge without treatment or discharge to a facility controlled by a different authority. <u>Do not</u> include combined sewers or storm sewers.
(5)	A <u>municipal combined wastewater collection system</u> . This system would include one or more interconnected sewers which carry both sanitary wastewaters and stormwaters, and which either discharge without treatment or to a facility operated by another authority. If the facility includes both separate sanitary sewers and combined sewers, the entire system will be reported as combined.
(6)	Other.
(7)	A municipal wastewater system for the bulk transmission of wastewater with or without pumping stations, and interceptor sewers, but without collector sewers, and which either discharge without treatment or to a facility operated by another authority. Effluent disposal facilities are also included in this classification.
(8)	Sludge handling facilities, including vehicles or vehicle fleets.
(9)	Individual septic system.
(0)	Community septic system

Item 16c - Nature of Facility -- Projected

Indicate the projected nature of facility by using coding conventions for 16(b) above.

Item 16d - Projected Change

If facility is projected to change, the proper code reflecting this change will be entered in Item 16d as follows:

<u>Code</u>	<u>Description</u>
(1)	Enlarge. The hydraulic capacity of a plant will be increased while the degree of treatment the plant is capable of achieving will remain the same. This change will be reflected on the EPA-1 form by Item 29-C-1 being larger than Item 29-B-1, Item 26 future being the same as Item 26 present, and all Item 29 projected design effluents being the same as the present design effluents.
(2)	Upgrade. The degree of treatment that a plant is capable of achieving will be improved but the hydraulic capacity will remain the same. This change will be reflected on the EPA-1 form by Item 29-C-1 being equal to or less than Item 29-B-1, Item 26 future reflecting a higher degree of treatment than Item 26 present, and/or some Item 29 projected design effluent value reflecting greater removal than the present design effluent.
(3)	Enlarge and upgrade. This means a plant's hydraulic capacity will be increased and the degree of treatment the plant is capable of achieving will be improved. This change will be reflected on the EPA-1 form by Item 29-C-1 being larger than Item 29-B-1, Item 26 future reflecting a higher degree of treatment than Item 26 present, and/or some Item 29 projected design effluent value reflecting greater removal than the present design effluent.
(4)	Install in New Plant. The construction of an entirely new facility on a site where no facility presently exists.
(5)	Replace. This describes the situation when an existing plant is demolished and a completely new plant is constructed on the same site. Generally the new plant provides the same degree of treatment as the demolished plant.
(6)	Abandon. This change is indicated when an authority relinquishes its responsibility for the collection and treatment of wastewater. Usually the treatment plant is taken out of operation and the sewage is diverted to another facility for treatment. The responsibility for operating the collection system (if one is involved) is

passed to a new authority. When this change is projected no needs should be shown for the abandoned facility. Any needs should be reflected on the form for the authority taking over the treatment and collection responsibility.

- (7) No change. This code is for facilities that will remain essentially unchanged through the year 2000.
- (8) Other. A number of situations are covered by this category. One common situation is a treatment plant which will require a capital expenditure, such as for a new sludge digester or chlorinator, but the degree of treatment and hydraulic capacity will not be changed. A comment is required on the reverse side of the EPA-1 facility form whenever this code is utilized.
- (9) Abandon Treatment Plant, Retain Sewers. This change is indicated when an authority that operates a treatment plant and a collection system takes the treatment plant out of operation and continues to operate the collection system. The sewage is diverted to a treatment plant operated by a different authority. This situation usually occurs when a regional treatment plant is constructed to serve several communities. When this change is projected no treatment needs should be shown for the facility involved. Any treatment needs should be reflected on the form for the authority taking over the treatment responsibility.

If a facility is, or will be, both a plant and a collection system (Item 16-B and/or Item 16-C = 1,2,3,A,B,C), then the projected change refers to the plant.

Item 16e - Date -- Start-up

If facility is not in operation, enter the projected year the plant will begin operation. If the facility is in operation, enter the date which most accurately represents the facility condition:

- (1) If the facility has been totally built with PL 92-500 grant funds, enter the year the facility began operation.
- (2) If the facility has been upgraded or expanded with PL 92-500 funds, enter the year the improvements to the facility began operation.
- (3) If the facility has not been improved or built with PL 92-500 grants funds, enter the year the facility began operation.

Item 16f - Date -- Abandon

If code (6) is indicated in Item 16(d), the year the facility is expected to be abandoned will be entered in Item 16(f).

Item 17 - Summary of Category Needs

General.

Item 17 of the EPA-1 facility form is designed for recording costs for Categories I through IV. The EPA Estimate for year 2000 populations, Column (a), State Estimate Column (b), and Portion Required to Satisfy Backlog, which is the need for the 1981 population, Column (c), for each category will be indicated in the unshaded and shaded areas of the form as described below. Columns (a) and (c) will be used by EPA and the Contractor, the unshaded portion of Column (b) will be used by the States to report costs which differ from the Contractor/EPA estimates. Only the Contractor will make entries in the shaded areas of Item 17.

An entry in Column (a), unshaded area, will indicate the pre-printed cost from the 1980 Survey, which has automatically been adjusted for inflation to January 1, 1981 dollars. If the Contractor revises this estimate, the pre-printed number will be crossed out and the revised figure will be entered above it. This area will also be used to report the estimate of needs for facilities not included in the 1980 Survey.

An entry in Column (a), shaded area, will indicate the final cost estimate after State review, reflecting either the Contractor and the State agreed upon estimate, or the Contractor/EPA estimate if agreement with the State could not be reached.

Column (b), unshaded area, will be utilized by the States after reviewing the Column (a) data-of-record cost, and/or revisions to it by the Contractor, for entering a revised cost if the State estimate disagrees with the data-of-record or the Contractor's revision. No entry in column (b) is interpreted to mean State agreement with the column (a) figure, i.e. the State and EPA estimates are the same.

Column (b), shaded area, will be utilized if the Contractor and the State cannot agree on a revised cost estimate after State review. The State figure will be entered in this area on the original form for data processing purposes by the Contractor.

An entry in Column (c), unshaded area, will indicate the estimated cost of new construction or of modifications to existing facilities to satisfy the backlog needs of the July 1, 1981 population.

An entry in Column (c), shaded area, will indicate the backlog cost presented in Column (c), unshaded area, after validation and adjustment. If agreement cannot be reached between the State and EPA/Contractor on a backlog cost estimate, a supplemental sheet is provided to allow the State to submit an independent estimate (See page 39). The following guidelines will be used to calculate the backlog needs under the various cost categories:

1. Categories I, IIA, IIB, and IVB will be incrementally interpolated, through the use of the appropriate cost curves, to develop the estimated costs necessary to satisfy the July 1, 1981 population and EPA-approved treatment levels.
2. Category IIIA will include all estimated costs for I/I correction. Backlog costs for this category will be the same as in the shaded area of Column (a).
3. Category IIIB will include all major sewer replacement and rehabilitation costs plus that portion of replacement cost which is apportioned to serve the 1981 population. Incremental replacement costs for sewers larger in size than those necessary to serve the 1981 population will not be reported as backlog.
4. Category IVA will include the cost of new collector sewers and appurtenant facilities. Backlog costs for this category will be limited only to the population requiring collection in 1972. The 2/3 rule will apply to the 2000 needs only.
5. Category IVB will include the cost of new interceptors and appurtenances. Backlog costs for this category will be limited to the present population requiring interceptors.

An entry in Column (d) will refer to Column (a); it does not relate to the backlog costs in Column (c). If the pre-printed basis of estimate code is different from the basis of estimate for the Contractor revised estimate, the Contractor will cross out the pre-printed code and will enter the revised code above it. If the State wishes to indicate a different code for revised data it may enter it in Column (b), by crossing out the Contractor code and entering the new code. The new code should also be entered in the unshaded area. The Contractor will enter the basis of estimate code for the final cost estimate in the shaded area. If a disagreement persists between the State and the Contractor on the basis of estimate, the final entry will reflect the Contractor/EPA code.

If the State submits an independent estimate, the Contractor will code the reason for the State estimate in Column (e) as listed on the back of the EPA-1 facility form for Item 17(e).

SEPARATE STATE ESTIMATE
BACKLOG NEEDS

Authority/Facility Number

Category	Portion Required to Satisfy Backlog EPA Estimate (B11/M11/Thou.) (a)	Portion Required to Satisfy Backlog Revised State Est. (B11/M11/Thou.) (b)	Basis of Estimate (c)	Reason for Separate Estimate (d)	Comments (e)
I					
IIA					
IIB					
IIIA					
IIIB					
IIV					
IIVB					

Instructions:

- Column (a) - Enter EPA/Contractor Final Needs Estimate
- Column (b) - Enter State Final Needs Estimate
- Column (c) - Enter Basis of Estimate for Separate State Estimates, using codes from 17(d) on reverse of EPA-1 form.
- Column (d) - Enter Reason for Separate State Estimate using codes from 17(e) on reverse of EPA-1 form.
- Column (e) - Enter any additional information in "Comments" column. For example, if "Code 7 - Other" is used as the Reason for Separate State Estimate in Column (d), the comments column may be used for explanation.

Categories I, IIA & IIB

Costs for treatment will be reported in Categories I (Secondary), IIA (Advanced Secondary), IIB (Advanced Wastewater Treatment).

For the 1982 Survey, the contractor will break down costs for treatment by treatment processes. Therefore, for a new AWT plant, the costs needed to bring a plant to Secondary treatment will be reported in Category I, and any additional costs to bring the plant to AWT will be reported in Category IIA and IIB as appropriate. In most cases, this split will be a best engineering estimate.

Pending the promulgation of final regulations regarding the definition of secondary treatment, costs for upgrading of oxidation ponds, lagoons and ditches and trickling filters will continue to be reported, as in past Surveys, as Category I needs.

A separate computer run is planned for the end of the Survey to estimate the reduction in Category I needs if the above-mentioned biological treatment processes are considered to be the equivalent of secondary treatment. Needs for replacement, expansion, or upgrading effluent requirements will be included in Category I needs.

1. If the required level of treatment is restricted to the parameters of BOD₅, suspended solids, fecal coliform bacteria and pH, and conforms to the following definitions, the plant costs will be reported as a Category I cost.

(a) Biochemical Oxygen Demand (BOD), five-day: The arithmetic mean of the values for effluent samples collected in a period of thirty (30) consecutive days will not exceed thirty (30) milligrams per liter; and the arithmetic mean of the values for effluent samples collected in a period of seven (7) consecutive days will not exceed forty-five (45) milligrams per liter; or the arithmetic mean of the values for effluent samples collected in a period of thirty (30) consecutive days will not exceed fifteen (15) percent of the arithmetic mean of values for influent samples collected at approximately the same times during the same period; i.e., an eighty-five (85) percent removal rate.

(b) Suspended Solids: The arithmetic mean of the values for effluent samples collected in a period of thirty (30) consecutive days will not exceed thirty (30) milligrams per liter; and the arithmetic mean of the values for effluent samples collected in a period of seven (7) consecutive days will not exceed forty-five (45) milligrams per liter; or the arithmetic mean of the values for effluent samples collected in a period of thirty (30) consecutive days will not exceed fifteen (15) percent of the arithmetic mean of the values for influent samples collected at approximately the same times during the same period; i.e., an eighty-five (85) percent removal rate, except as applied to lagoon systems.

(c) pH: The effluent values for pH will remain within the limits of 6.0 to 9.0.

(d) Fecal Coliform Bacteria: The geometric mean of the values for effluent samples collected in a period of thirty (30) consecutive days will not exceed 200 per 100 milliliters; and the geometric mean of the values for effluent samples collected in a period of seven (7) consecutive days will not exceed 400 per 100 milliliters.

Costs for treatment plant outfall will be included in Category I, IIA or IIB.

2. If the required level of treatment for removal of BOD is less than 25 but less stringent than 9 mg/l or includes additional limiting parameters for phosphorous and ammonia, and does not require removal of total nitrogen, the associated incremental costs above secondary will be reported as Category IIA.

3. If the required level of treatment for BOD is less than 10 mg/l or includes additional limiting parameters for ammonia, and nitrogen, the associated incremental costs above AST will be reported as Category IIB. Only those facilities which project installation of denitrification, ammonia stripping, or ion exchange (codes 25, 47, and 49) will be considered as AWT facilities (Category IIB) when projected BOD is greater than 9.

4. If land treatment of the effluent is utilized, it will be so indicated in Item 32 as code (54), (55), or (56), as appropriate, and all costs for the land treatment, including land purchase, will be reported as Category I, IIA, or IIB, depending upon the effluent limitations required by the NPDES permit.

5. If lagoon or pond treatment of effluent is utilized, the amount of suspended solids of the pond or lagoon effluent should comply with "Suspended Solids Limitations for Wastewater Treatment Ponds" 40 CFR 133, Part III published in the Federal Register on October 7, 1977. The pond treatment should be indicated in Item 32 as Code (57) or Code (58) whichever is appropriate, and all costs, including land purchase, if eligible, will be reported as Category I, IIA or IIB, depending upon the effluent limitation required by the NPDES permit.

6. Costs for individual or community septic tanks will be reported as Category I.

In a combined sewer system, all costs attributable to that portion of the treatment plant capacity utilized to correct periodic bypasses or overflows will be excluded from the Category I or II costs and will be reported as a Category V cost. These costs will be identified in a separate effort. The cost of constructing storage and/or retention basins, lagoons or other facilities to control the discharge of pollutants from combined sewer overflows or bypasses will also be reported under Category V.

Eligible construction costs will include all grant eligible costs; i.e., construction contract costs, design costs, contingencies, legal-administrative costs, and effect of OSHA and other regulatory requirements. Total eligible plant costs will include facilities such as

administrative buildings, shops, laboratories, landscaping, outside piping, and utilities. Land costs will not be included except when land is used as an integral part of the treatment process or for the ultimate disposal of wastes.

Categories IIIA and IIIB

Category III deals with sanitary sewer systems and has been split to differentiate between two types of needs. Section A of Category III considers Infiltration/Inflow (I/I) Correction, as defined by the provisions of Section 201 of P.L. 92-500. Section B considers Major Sewer System Rehabilitation, as defined in Section 211 of P.L. 92-500. This section of the Act provides for financial assistance grants for replacement or major rehabilitation of an existing sewage collection and transmission system if it is necessary to the total integrity and performance of the waste conveyance and treatment facilities. The cost of correction of I/I in combined sewer systems and the cost of correction and/or treatment of overflows and bypass flows from such sewers will not be reported under Category IIIA; these needs will be considered under Category V. Major rehabilitation or replacement of separate or combined collection systems may, however, be reported in Category IIIB when necessary for the overall integrity and performance of the sewer system.

For the purpose of this Survey, replacement is defined as the construction of parallel sewers or sewers which perform the function of existing sewers where existing sewers are to be abandoned. Relief sewers do not fall within this definition and will be reported under Category IVB. Major rehabilitation is defined as extensive repair of existing sewers beyond the scope of normal maintenance programs; e.g., cement mortar lining of deteriorated brick sewers. The cost of rehabilitation cannot exceed replacement costs.

Costs for the following will be reported in Category IIIA: (1) I/I analysis; (2) sewer system evaluation survey; and (3) corrective action to reduce I/I if cost-effective.

The following guidance regarding Category IIIA needs is provided to avoid duplication and allow eligible costs to be reported accurately:

1. If overflows in a sanitary sewer system or bypasses do not occur, and treatment costs are included in Categories I and II for excessive I/I, a cost for I/I correction will be reported in Category IIIA, but an appropriate reduction of the Category I or II costs will also be effected to account for I/I that will be removed from the system.
2. If overflows occur in a sanitary sewer system due to excessive I/I, and costs for treatment were not included in Categories I or II in the 1980 Survey, such costs for I/I correction, satellite overflow treatment facilities, or storage and pump back facilities, will be reported in Category IIIA. This will not, however, apply to combined sewer systems, which will be considered under Category V.

Cost estimates will be reported in Category IIIA when the basis of estimate code is (2), (3), (4), (6), or (7), or the basis of estimate is left blank when a Category IIIA estimate is provided for the performance of an I/I analysis.

Basis of estimate code (7) will be used only when the I/I flow is a generally, locally-known condition but is undocumented. The procedure for estimating the I/I correction will be as follows:

1. Determine the unjustified average, daily per capita flow in the existing treatment systems, normally all flows in excess of the appropriate flow per capita figure.
2. Multiply the unjustified per capita flow computed in Step 1, above, by the year 2000 population.
3. Determine the cost of treating the unjustified flow computed in Step 2, above, by the use of the EPA cost curves as follows:
 - (a) Determine the size of treatment plant necessary to treat the unjustified and justified flows together.
 - (b) Determine the cost of the plant computed in Step (a), above, from the EPA cost curves.
 - (c) Subtract from the cost computed in Step (b), above, the cost reported for treatment in Category I or II for the justified flow.
4. Divide the cost of treating the unjustified flow computed in Step 3, above, by two and enter the result in Category IIIA, Item 17a.
5. Enter the unjustified flow developed in Step 3 in Item 22 and enter Code 1 in Item 21.

A blank basis of estimate code will be used when I/I problems are suspected because of high per capita flows or other factors based upon reasonable engineering judgement. In this case, the rule-of-thumb for determination of the cost for an I/I analysis will be one (1) dollar per person presently receiving collection from the facility, but not to exceed a total of \$100,000 per facility. No known corrective actions (Code 1) will be recorded in Item 21, and no flow will be recorded in Item 22.

If an I/I analysis has been completed, that report will be utilized as a basis of estimating the cost of I/I corrective measures even though an evaluation survey may not have been completed. Costs for I/I corrective measures will be included in Category IIIA, Item 17a with a basis of estimate Code 2. The necessary I/I corrective action will be recorded in Item 21 and the appropriate flow in Item 22.

Cost estimates for Category IIIB costs will be provided only if the basis of estimate code is (2), (3), (4) or (6).

All needs reported in Category IIIB must reflect replacement or major rehabilitation costs necessary to insure the total integrity and performance of the waste conveyance and treatment facilities. Normal system operation and maintenance costs will not be included as a need. Costs will be reported in Category IIIB only if the sewers do not have excessive I/I. All costs for improving sewers with excessive I/I will be reported in Categories IIIA or V in accordance with the guidance for that category.

Categories IVA and IVB

Category IV is separated into two sections in order to more accurately reflect various needs. These sections consist of Section A for "New Collectors" and Section B for "New Interceptors".

Force mains, pumping stations, outfalls, and other related appurtenant structures will be reported under Category IVA or IVB, depending on whether their primary mechanical function relates to the collectors or the interceptors.

Engineering details relating to collectors, interceptors, force mains, outfalls and pumping stations, as well as cost information, will be delineated in Item 19 of the EPA-1 facility form. Cost information will therefore appear in both Items 17 and 19. The cost of individual items will be reflected in Item 19, and will be summarized as one total cost in Item 17. Note that the total dollars for Item 19 must equal the total for Categories IVA and IVB in Item 17.

Costs will be included in Category IVA where there is a demonstrated need resulting from raw discharges; seepage to surface water from septic tanks and cesspools; and/or to comply with applicable court orders, permit stipulations, or administrative actions. Section 211 of P.L. 95-217 provides that new collectors will be funded in communities existing prior to the enactment of the Act on October 18, 1972, and then only if the community has sufficient existing or planned capacity to adequately treat the collected sewage. Sewage collection systems for new communities, subdivisions, and urban areas are not considered under the construction grant program; provisions for these sewers are considered a part of the development cost of the new construction. In accordance with EPA eligibility policy, collector needs must comply with the two-thirds (2/3) existing population rule. The 2/3 rule means that no construction grant award will be made for a new sewer system in a community in existence on October 18, 1972, unless two-thirds of the design flow capacity through the sewer system will be for wastewaters originating from that portion of the community inhabited on October 18, 1972, as described in detail in Section VI of this procedural guidance document.

Item 18 - Facility Population

Item 18 of the EPA-1 facility form will be utilized to report the total population which receives treatment and/or collection services from the facility. It is segmented into present resident population, present non-resident population; projected resident population; and projected non-resident population. The data-of-record for each of these categories will be listed for the present, year 1981, and projected, year 2000, population receiving treatment, not receiving treatment, receiving collection and not receiving collection services.

The term "non-resident" applies to transient, seasonal, commuter worker and tourist populations, and other persons who must be served by local systems even though no local residence is maintained. Non-resident populations do not include any form of population-equivalent based on industrial or commercial flows. An example of a non-resident population would be an urban business service area with a resident population of ten thousand (10,000) but a daytime, working population of twenty-five thousand (25,000). The non-resident population would thus be fifteen thousand (15,000).

The service area of any facility will be deemed to include not only the boundaries of the areas actually served, but also any enclaves whose residents are served by septic tanks, outhouses, or other non-municipal systems. An overall restriction on population in all service areas will be that the total resident population projected for the year 2000 for an entire State cannot exceed the overall population as reported in the year 2000 population projections developed by the Bureau of Economic Analysis and the EPA.

The data-of-record which will appear on the pre-printed forms will indicate the resident population as well as the projected population, as reported in the 1980 Needs Survey. For the 1982 Needs Survey, present population ceilings are defined as the 1980 population as estimated by the Bureau of Census. Projected population ceilings are defined as the 1977 Bureau of Economic Analysis Year 2000 population projections or EPA Headquarters approved state variances as reported in the 1980 Survey for the year 2000 population projections as defined by the Bureau of Economic Analysis.

Item 19 - Needs for New Collectors, Interceptors, Force Mains and Pumping Stations

Item 19 will be utilized to report the engineering and cost details related to segments of the collection systems and appurtenances. Separate lines are provided so that collection system components which exhibit similar cost functions may be listed together. For example, if several different size pipes require the same cost factor in the cost estimating guidelines due to the limitations of the cost table in only providing the most common pipe diameter sizes, the data for all pipe falling into this size classification will be consolidated as one line entry.

Column (a) of Item 19 will be used to identify the type of item being listed; code identifiers will be obtained from the Code Reference Chart for Item 19 on the reverse side of the EPA-1 form. If it is determined through analysis of the 1980 Survey forms, engineering reports or other documentation that a single authority, as reported on a single EPA-1 facility form, contains more than six (6) distinct entries for collectors and/or interceptors, the following procedures will be used to report the entries.

1. Various size pipes will be grouped together after estimating individual costs, indicating the one pipe diameter which accounts for the greatest portion of the combined pipe length reported in Item 19(c). Pump stations will likewise be logically grouped, entering the average pump station capacity of the group in Item 19(c).

2. Collector systems and interceptor system components will be listed separately. Only those sizes which can be logically grouped will be presented in this manner in order to permit all cost information to be included. An example of this procedure is presented below for illustrative purposes:

Example:

If an authority has the following pipe requirements:

8" - diameter	:	10,000 feet
10" - diameter	:	8,000 feet
24" - diameter	:	2,000 feet
30" - diameter	:	3,000 feet

And:

Only two line entries are available for inclusion of this information.

Then:

In order to include all of the various pipe diameters in Item 19, add the lengths of the 8" and 10" diameter pipe and enter a total length of 18,000 feet of 8"-diameter pipe. Likewise, add the lengths of 24" and 30" diameter pipe and enter as a total length of 5,000 feet of 30" diameter pipe.

3. All collector pipe diameters and all interceptor pipe diameters will not be averaged.

The above procedure will be followed only to the extent - necessary to reduce the total number of entry items in Item 19 to six (6). The only probable case in which all pipe of a similar type will have to be averaged would be when an authority has several force mains and pumping stations, in addition to the sewer lines.

The diameter of pipe in Column (b) and length of pipe in Column (c) will be reported in inches and feet, respectively. The capacity of pump station in Column (c) will be reported in MGD.

Item 20 - Disposal of Liquid Effluents

Item 20 relates to the ultimate disposal method for liquid effluents. Up to four (4) entries may be inserted in this section; for each entry, Column (a), (b), and (c) will require the appropriate code. These columns will be coded in the following manner:

1. Disposal: The appropriate code for the type of ultimate disposal presently in use, proposed for use, or required will be one of the following:

<u>Code</u>	<u>Description</u>
(1)	Outfall to Surface Waters - Direct discharge to a body of fresh water.
(2)	Ocean Outfall - Direct discharge to an ocean, estuary, bay.
(3)	Groundwater Recharge - Disposal of effluent via deep well or other methods in order to replenish a groundwater aquifer for the purpose of municipal, agricultural, or industrial reuse, or to control salt water intrusion or land subsidence.
(4)	Other Land Disposal - Disposal of effluent on public or private land for other than agricultural purposes. No effluent recovery is practiced. Examples: municipal golf course watering, highway right-of-way maintenance.
(5)	Recycling and Reuse - Direct reuse of effluent in an industrial process, for example, cooling or quenching. Also reuse or reclamation of the water for other than irrigation.
(6)	Septic Tank Field - Disposal of untreated wastes or effluent to a septic tank and leach field.
(7)	Other - Any method of disposal not described elsewhere in this section.
(8)	No Discharge - No discharge to surface or groundwaters. Example: complete retention in a lagoon.
(9)	Spray Irrigation - Reuse of treated effluent in agriculture by spraying.
(A)	Ditch Irrigation - Reuse of treated effluent in agriculture using a ditch, swale, or other surface flow method.
(B)	To Other Wastewater Treatment Plant - Direct transmission of treated effluent or raw wastes to another wastewater treatment plant for further treatment prior to discharge or reuse. The Authority/Facility number of the latter plant is to be entered in Item 31b.

A comment is required on the reverse side of the EPA-1 facility form whenever codes (4) and (7) are utilized. If Code 8 is utilized, the facility/authority number of the plant which receives the discharge should be entered in Item 31(b).

2. Use: The appropriate code for the status of the disposal indicated in Column (a) will be entered in Column (b) utilizing the following coding conventions:

<u>Code</u>	<u>Description</u>
(1)	Now in use.
(2)	Under construction or provided for in an approved EPA grant.
(3)	Required, but now yet approved or funded.
(4)	Not applicable.
(5)	Installed, but not in use.

3. Change: The appropriate code for the projected change in the indicated disposal system will be entered in Column (c) utilizing the following coding conventions:

<u>Code</u>	<u>Description</u>
(1)	Enlarge (increase capacity)
(2)	Upgrade effluent quality.
(3)	Enlarge and upgrade.
(4)	New construction; i.e., construct new plant and/or install in new plant.
(5)	Replace an existing plant or plant process.
(6)	Abandon.
(7)	No change.
(8)	Modifications or other changes not specifically covered previously. A comment is required on the reverse side of the EPA-1 form whenever this code is utilized.

Item 21 - Required Infiltration/Inflow Correction Action

If needs are reported in Category IIIA, as discussed for Item 17, an entry will be required in Item 21. The appropriate code indicating the action necessary to correct I/I conditions to meet the requirements of Section 201 and/or 211 of P.L. 95-217 will be entered utilizing the following coding conventions:

<u>Code</u>	<u>Description</u>
(1)	Not known at this time.
(2)	None.
(3)	Seal or grout sewer lines.
(4)	Replace/reline sewer sections.
(5)	Change/create flow routing system.
(6)	Provide flow equalization.
(7)	Other corrective actions. A comment is required on the reverse side of the EPA-1 form whenever this code is utilized.

Item 22 - Estimated I/I Flow

If a code (3) through (7) is entered in Item 21, that portion of the average daily flow through the facility which is the result of I/I, and which will be eliminated by I/I correction will be reported in Item 22 in MGD.

Item 23 - Major Rehabilitation/Replacement Required

Item 23 will be completed if needs are reported in Category IIIB utilizing the codes presented for Item 21. Costs will be reported in Item 17, Category IIIB for the necessary rehabilitation.

Item 24 - Do Wastewaters Originate in Communities Existing before October 18, 1972?

Either a "YES" or "NO" will be entered in answer to the above question in Item 24. This answer will require substantiation.

Item 25 - 1972 Collection Population

The resident population which existed on October 18, 1972, for which new collector sewers are required as of January 1, 1982 will be entered in Item 25.

Item 26 - Effluent Characteristics

The appropriate coding conventions to be utilized for present design and future design effluent characteristics, which will be entered in Item 26, are as follows:

<u>Code</u>	<u>Description</u>
(0)	No discharge.
(1)	Raw discharge.
(2)	Primary.
(3)	Advanced primary.
(4)	Secondary. Effluent limitations of BOD/SS 30/30 mg/l or 85 percent removal with disinfection process. Other definitions of secondary treatment (25/30 or 20/20) may be used if included in EPA approved State criteria.
(5)	Advanced secondary treatment (AST). Effluent limitations more stringent than secondary but less stringent than AWT. Includes facilities requiring secondary treatment with phosphorus removal.
(6)	Advanced wastewater treatment (AWT). Treatment levels providing for maximum monthly average BOD/SS less than 10 mg/l and/or total nitrogen removal of greater than 50 percent. (Total nitrogen removal = TKN plus nitrate and nitrite).

Item 27 - Reasons

If the present or future effluent characteristics entered in Item 26 are more stringent than secondary treatment, the reasons which impose the requirement will be indicated in Item 27 utilizing the codes presented below:

<u>Code</u>	<u>Description</u>
(0)	A water quality plan which has been approved by EPA.
(1)	Order of State Court.
(2)	Order of Federal Court.
(3)	State permit or license.
(4)	NPDES permit or license.
(5)	State enforcement order or proceeding.
(6)	Federal enforcement order or proceeding.
(7)	Voluntary agreement which includes a schedule for compliance and improvements.
(8)	Other. A comment is required on the reverse side of the EPA-1 form whenever this code is utilized.
(9)	A certification by the State that the body of water receiving this discharge is water quality dependent and that more stringent treatment is necessary to meet federally-approved Water Quality Standards for dissolved oxygen or nutrient limitations.

Item 28 - Supplemental Sheets

If the facility form requires the use of a supplemental sheet, enter the appropriate code(s) as follows:

<u>Code</u>	<u>Description</u>
(1)	Toxic/other codes.
(2)	Additional treatment.
(3)	Industrial Cost Exclusion
(4)	Separate State Estimate - Backlog Needs

Item 29 - Flows/Concentrations

Design Flow

Design flow will represent the monthly average, dry-weather influent and effluent levels which the plant will be designed to handle.

The maximum permissible per capita flow allowance which will be utilized in Item 29 will be as follows, in accordance with EPA's Cost-Effective Guidelines:

1. Non-SMSA cities and towns with a projected design population of 5,000 or less; applicable to the resident population only:

95 gpcd

2. Non-SMSA cities and towns with a projected design population of between 5,000 and 10,000; applicable to the resident population only:

105 gpcd

3. SMSA planning areas and other non-SMSA cities with a projected design population greater than or equal to 10,000; applicable to the resident population only:

115 gpcd

4. All non-resident populations:

60 gpcd

These flow values relate to domestic flow and include an allowable factor for commercial flows and for I/I that is not considered excessive, e.g., that amount of I/I which cannot be economically eliminated. The flow values used in the Survey will relate to design flow. Per capita domestic and commercial flows do not include industrial flow, excessive I/I, or the wet-weather component of flow in a combined sewer system. Design population will be used in calculating per capita figures.

If the facility is a plant which discharges its effluent to another facility, the flow should be reported in Item 29.

Total flow is defined as all wastewaters moving through the treatment plant; including domestic, commercial, industrial, and I/I. This figure will be reported in MGD. Industrial flow is that amount of flow, moving through the plant, that originates from industrial sources. Total industrial flow will be reported in MGD in Item 29 but costs will be adjusted for ICE in items 17(a) and (c) for categories I & II.

All flows in the 1982 Survey will be monthly average flow rather than maximum flows. Average, non-industrial flows will include non-excessive, average seasonable I/I and acceptable commercial and institutional flows.

Concentrations of the following constituents will be designated to provide characterization of the plant influent and effluent, and the basis for plant design. Only those constituents significant to the plant unit process scheme will be entered.

1. For BOD₅ (Biochemical Oxygen Demand, Five Day) the conventional definition will be applicable. This entry will be reported in milligrams per liter (mg/l).
2. For suspended solids, the conventional definition will be applicable. This entry will be reported in milligrams per liter (mg/l).
3. For phosphorus, the conventional definition will be applicable. This entry will be reported in milligrams per liter (mg/l).
4. For ammonia (NH₃), the conventional definition will be applicable. This entry will be reported in milligrams per liter (mg/l).

Item 30 - Existing Other - Projected Other

If there are known toxics in the influent to a facility enter the appropriate code in Item 30. Influent/effluent quantities do not apply to this Item.

The codes for the toxics are as follows:

<u>Code</u>	<u>Description</u>
001	Acenaphthene
002	Acrolein
003	Acrylonitrile
004	Benzene
005	Benzidine
006	Carbon tetrachloride (tetrachloromethane)
007	Chlorobenzene
008	1,2,4-trichlorobenzene
009	Hexachlorobenzene
010	1,2-dichloroethane
011	1,1,1-trichloroethane
012	Hexachloroethane
013	1,1-dichloroethane
014	1,1,2-trichloroethane
015	1,1,2,2-tetrachloroethane
016	Chloroethane
017	Bis (chloromethyl) ether
018	Bis (2-chloroethyl) ether
019	2-chloroethyl vinyl ether (mixed)
020	2-chloronaphthalene
021	2,4,6-trichlorophenol
022	Parachlorometa cresol

023	Chloroform (trichloromethane)
024	2-chlorophenol
025	1,2-dichlorobenzene
026	1,3-dichlorobenzene
027	1,4-dichlorobenzene
028	3,3-dichlorobenzene
029	1,1-dichloroethylene
030	1,2-trans-dichloroethylene
031	2,4-dichlorophenol
032	1,2-dichloropropane
033	1,2-dichloropropylene (1,3-dichloropropene)
034	2,4-dimethylphenol
035	2,4-dinitrotoluene
036	2,6-dinitrotoluene

<u>Code</u>	<u>Description</u>
037	1,2-diphenylhydrazine
038	Ethylbenzene
039	Fluoranthene
040	4-chlorophenyl phenyl ether
041	4-bromophenyl phenyl ether
042	Bis(2-chloroisopropyl) ether
043	Bis(2-chloroethoxy) methane
044	Methylene chloride (dichloromethane)
045	Methyl chloride (chloromethane)
046	Methyl bromide (bromomethane)
047	Bromoform (tribromomethane)
048	Dichlorobromomethane
049	Trichlorofluoromethane
050	Dichlorodifluoromethane
051	Chlorodibromomethane
052	Hexachlorobutadiene
053	Hexachlorocyclopentadiene
054	Isophorone
055	Naphthalene
056	Nitrobenzene
057	2-nitrophenol
058	4-nitrophenol
059	2,4-dinitrophenol
060	4,6-dinitro-o-cresol
061	N-nitrosodimethylamine
062	N-nitrosodiphenylamine
063	N-nitrosodi-n-propylamine
064	Pentachlorophenol
065	Phenol
066	Bis(2-ethylhexyl) phthalate
067	Butyl benzyl phthalate

068	Di-n-butyl phthalate
069	Di-n-octyl phthalate
070	Diethyl phthalate
071	Dimethyl phthalate
072	1,2-benzanthracene (benzo(a)anthracene)
073	Benzo(a)pyrene (3,4-benzopyrene)
074	3,4-Benzofluoranthene (benzo(b)fluoranthene)
075	11,12-benzofluoranthene (benzo(k)fluoranthene)
076	Chrysene
077	Acenaphthylene
078	Anthracene
079	1,12-benzoperylene (benzo(ghi)perylene)
080	Fluorene
081	Phenanthrene

<u>Code</u>	<u>Description</u>
082	1,2,5,6-dibenzanthracene (dibenzo(a,h)anthracene)
083	Indeno(1,2,3-cd) pyrene (2,3-o-phenylene pyrene)
084	Pyrene
085	Tetrachloroethylene
086	Toluene
087	Trichloroethylene
088	Vinyl chloride (chloroethylene)
089	Aldrin
090	Dieldrin
091	Chlordane (technical mixture and metabolites)
092	4,4-DDT
093	4,4-DDE (p,p-DDX)
094	4,4-DDD (p,p-TDE)
095	Alpha-endosulfan
096	Beta-endosulfan
097	Endosulfan sulfate
098	Endrin
099	Endrin aldehyde
100	Heptachlor
101	Heptachlor epoxide (BHC-hexachlorocyclohexane)
102	Alpha-BHC
103	Beta-BHC
104	Gamma-BHC (lindane)
105	Delta-BHC (PCB-polychlorinated biphenyls)

106	PCB-1242 (Arochlor 1242)
107	PCB-1254 (Arochlor 1254)
108	PCB-1221 (Arochlor 1221)
109	PCB-1232 (Arochlor 1232)
110	PCB-1248 (Arochlor 1248)
111	PCB-1260 (Arochlor 1260)
112	PCB-1016 (Arochlor 1016)
113	Toxaphene
114	Antimony
115	Arsenic
116	Asbestos
117	Beryllium
118	Cadmium
119	Chromium
120	Copper
121	Cyanide
122	Lead
123	Mercury
124	Nickel
125	Selenium
126	Silver
127	Tallium

<u>Code</u>	<u>Description</u>
128	Zinc
129	2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD)
130	Xylenes
131	Alkyl epoxides
150	Total N
151	Total kjeldahl nitrogen (TKN)
152	Dissolved oxygen (OO)

A code "999" on the preprinted EPA-1 form denotes that there was a code in "Other" for the 1980 Survey. The code "999" should be changed to the appropriate code from the above list. If more than 6 codes are required, Item 28 should be coded as (1).

Item 31a - Receives Discharge From

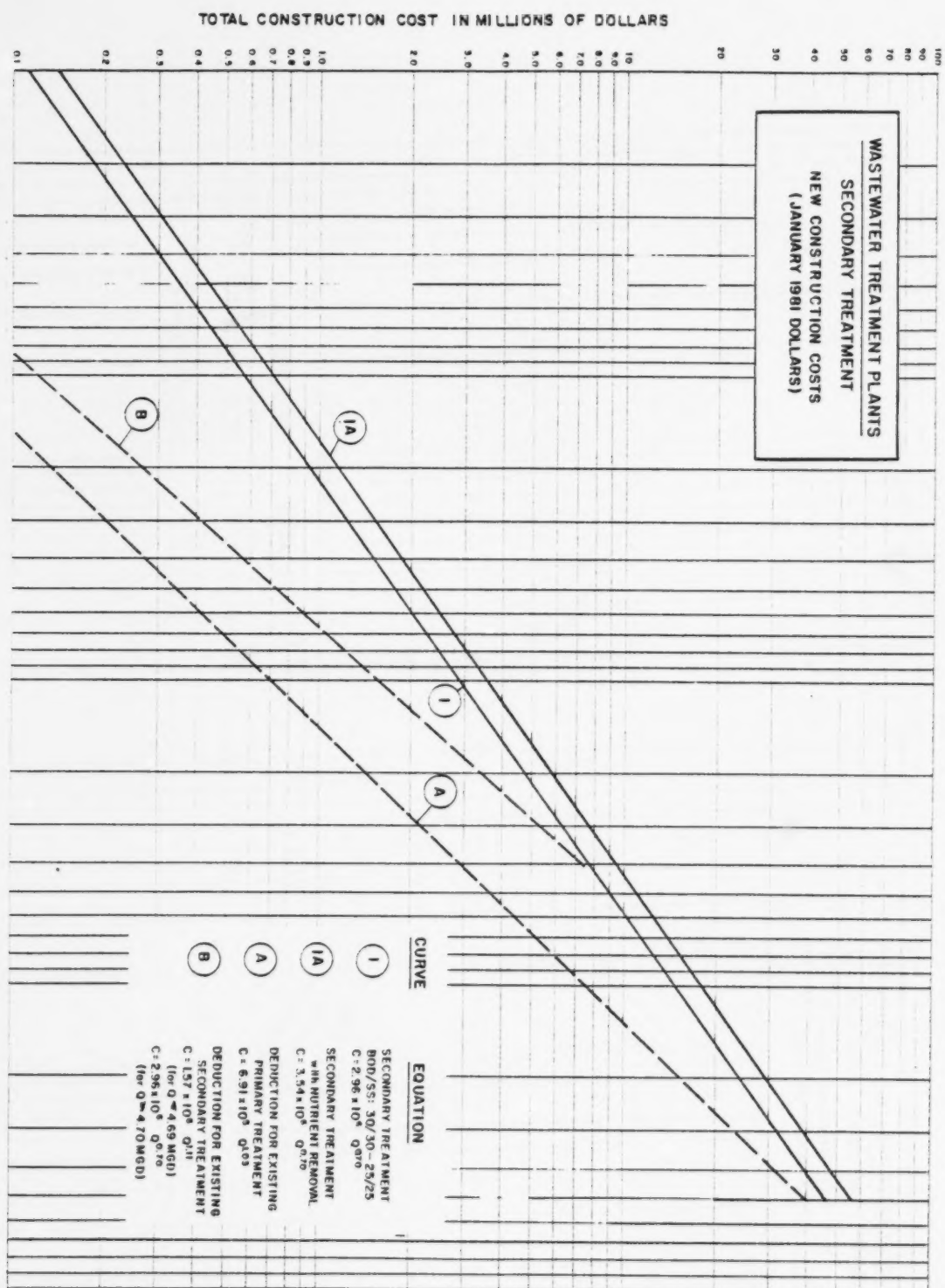
If the facility receives discharge from another, enter the appropriate State authority/facility number in Item 31a.

Item 31b - Discharges To

If the facility discharges to another facility enter the appropriate State authority/facility number for the plant to which it discharges in Item 31b. If the facility is a treatment plant, enter the flow in Item 29.

Item 32 - Treatment and Sludge Handling

Three columns complete this section of the EPA-1 facility form. Column (a) defines the type of treatment and sludge handling processes to be included in the facility; Column (b) defines the current use; and Column (c) indicates the projected change to the process. The codes which will be entered in these columns are listed in the Code Reference Chart on the reverse side of the EPA-1 form. A more complete guide to the definition and codes of liquid and sludge treatment processes is provided in Appendix C. It should be noted that Codes (05), (13), (46), (53), (63), (78), (84), (88), and (94) will require a comment on the reverse side of the EPA-1 form. Also note that if more than 20 processes are listed, Item 28 should be coded (2).



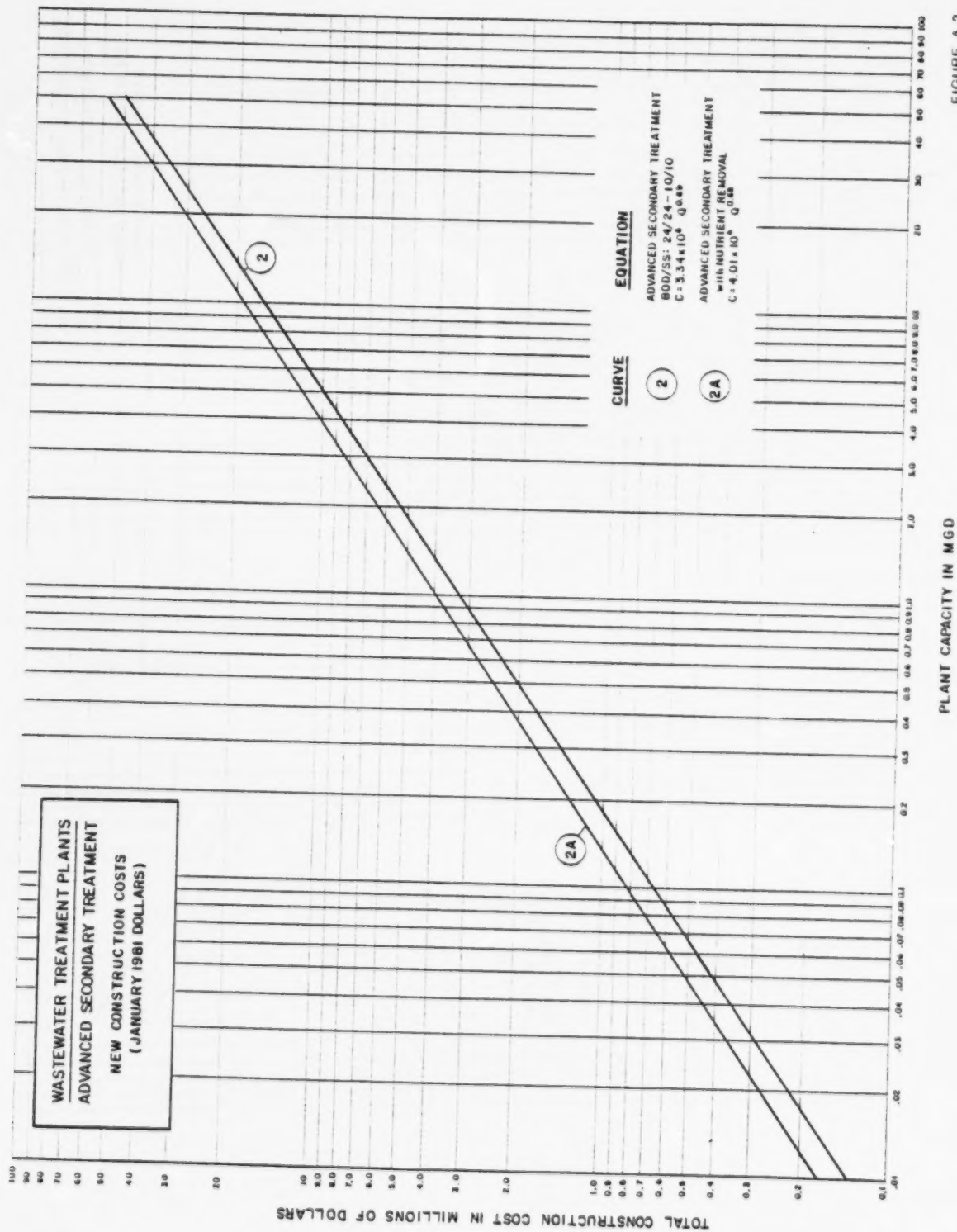


FIGURE A.2

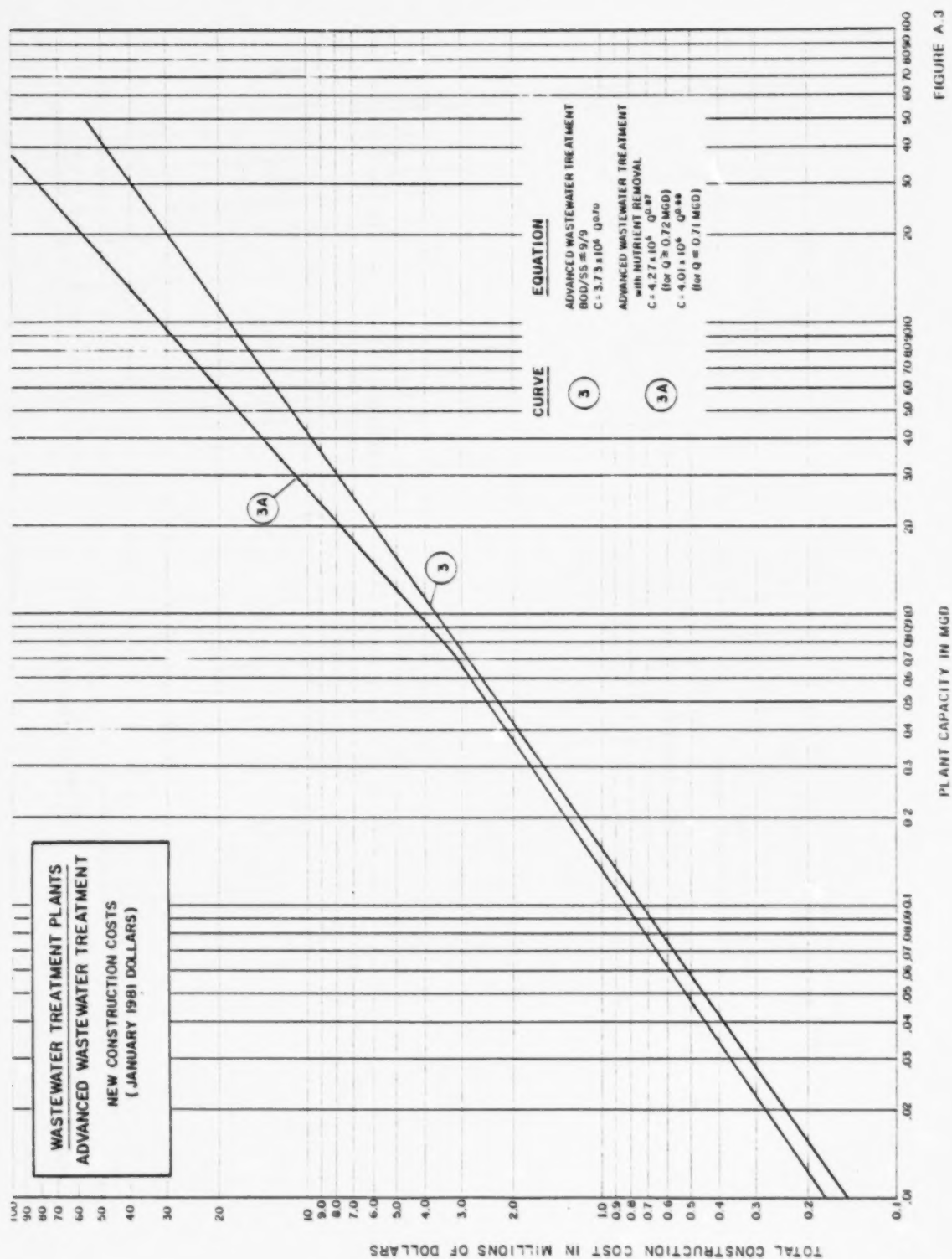


FIGURE A.3

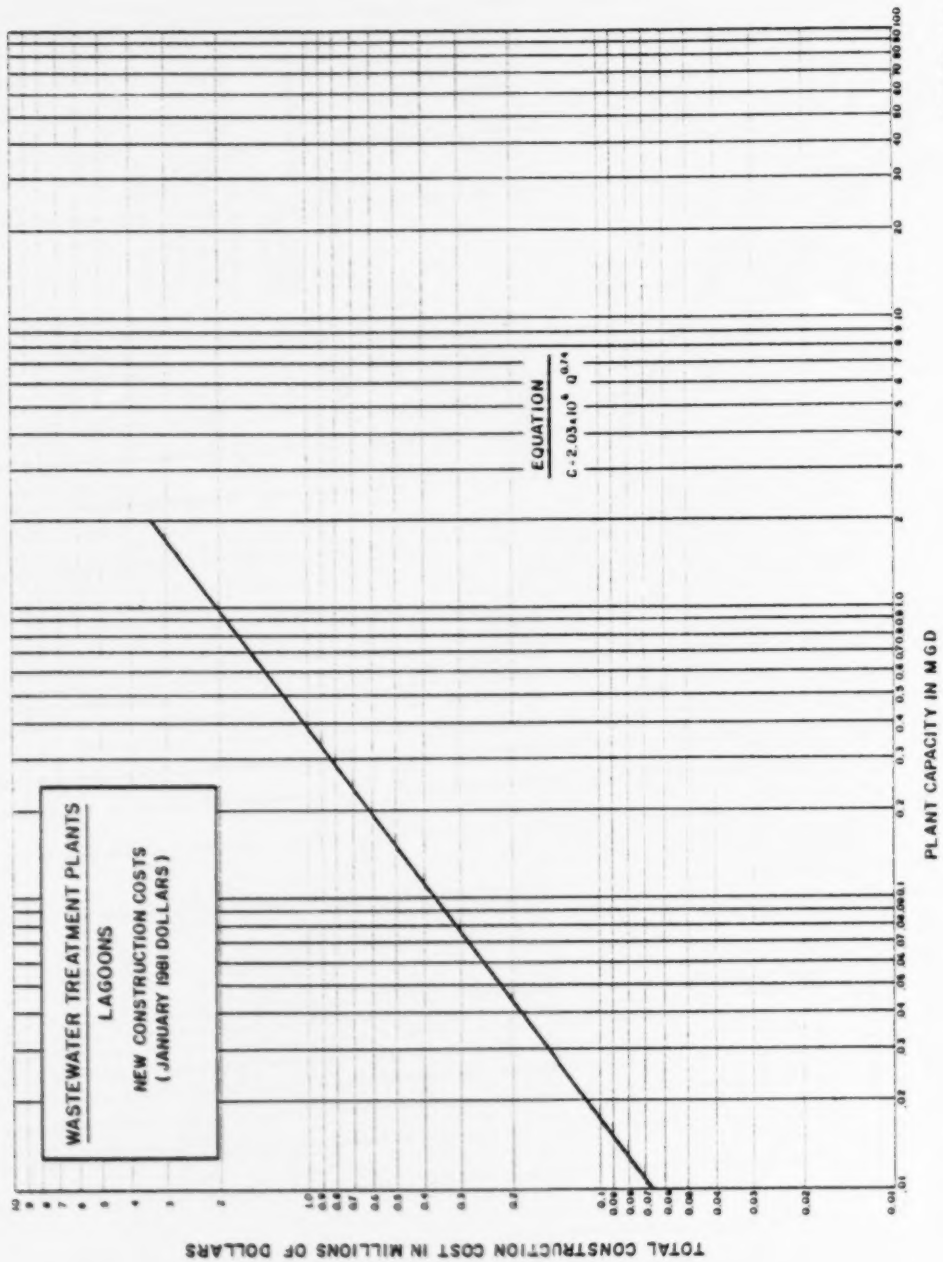
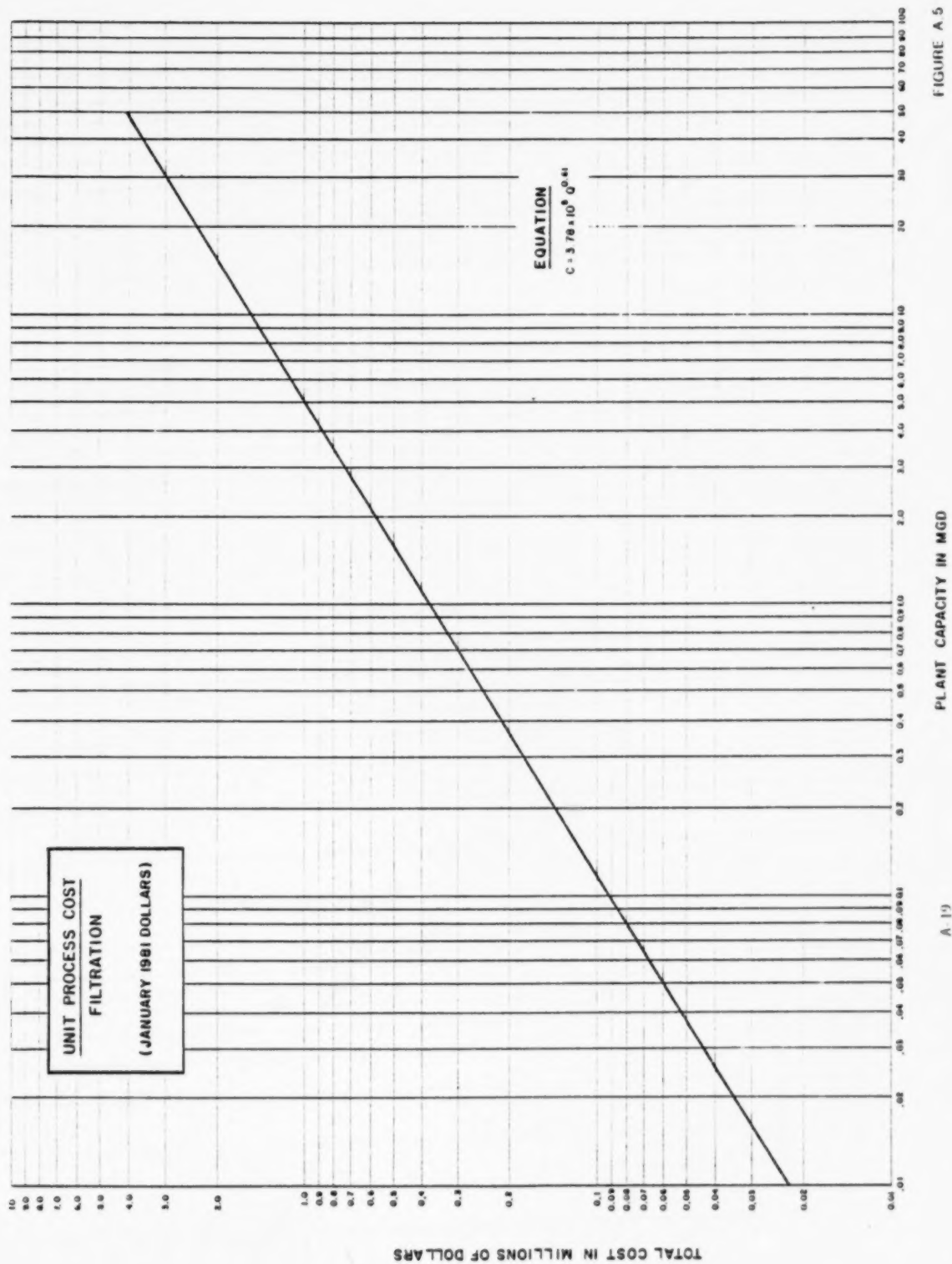
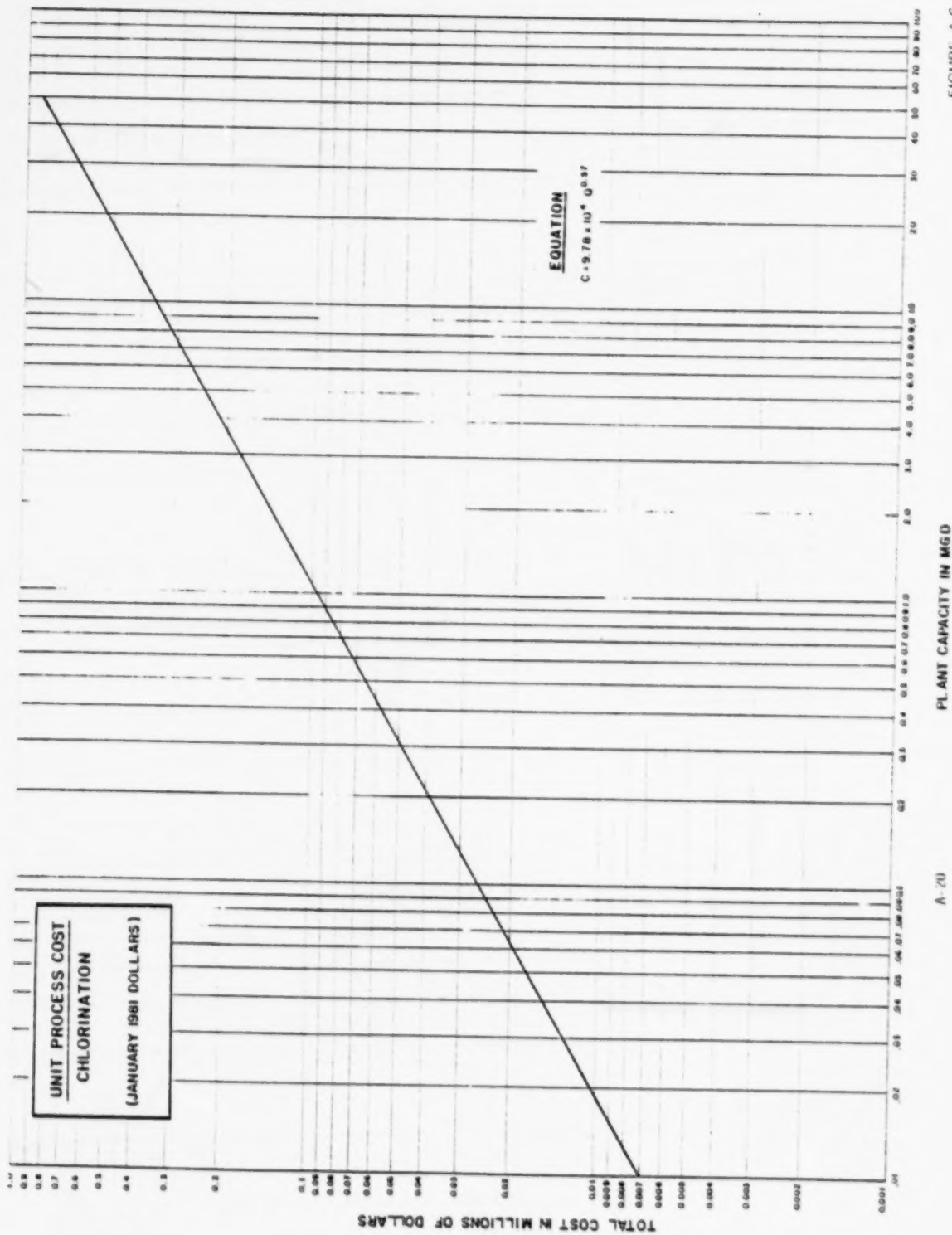


FIGURE A.4





- o No backlog need can be estimated using rule of thumb techniques for facilities that do not have their cost of record need estimated by rule of thumb techniques.
- o The degree of treatment specified in a facility's permit requirements is the degree of treatment for which backlog needs are estimated.

Backlog Calculation: Basis of Estimate Code = 7

All cost estimates prepared using procedures outlined in Appendix A are reported as having a basis of estimate Code 7. The basic difference between cost of record estimates and backlog estimates is the population value used in calculating wastewater flows for plants and sewers and for determining lengths of sanitary sewer allowable. The cost of record estimate utilizes the projected populations (Items 18c and 18d) and the growth populations (difference between Items 18a and 18b and Items 18c and 18d). The backlog estimate utilizes only the present population (Items 18a and 18b). All other procedures used in estimating costs are the same for the cost of record and backlog cost estimates.

Backlog Calculation: Basis of Estimate Code ≠ 7

All cost estimates prepared using procedures other than those outlined in Appendix A are reported as having a basis of estimate code other than 7. Included in this category are estimates obtained from planning documents or prepared using cost of comparable construction techniques. To estimate a backlog cost for these type facilities requires considerable investigation and engineering judgement. The basic methodology to be followed in preparing the backlog cost is to apply a ratio to the cost of record estimate. The ratio is based on the comparison of some aspect of the project which is common to the present and the future situation. Some aspects which relate the present and projected situations are the changes in population or wastewater flows and the length of sewer necessary to collect the present and projected populations.

Each facility must be evaluated on an individual basis when preparing a backlog cost estimate so that the present requirements of a community are accurately reflected.

IX. Combined Sewer Systems Worksheet Instructions

Objectives

The objective of the combined sewer system worksheet is to establish a data base for all combined sewer systems within the United States. This combined sewer system data base will be used to estimate the total cost of controlling pollution from combined sewer overflow (CSO) and to establish the status of planning, design, and construction of facilities for the control of CSO. Basic data needs are grouped into five types: (1) identification and combined sewer system data, (2) receiving water characteristics, (3) status of CSO abatement projects, (4) grant information, and (5) grant-eligible cost estimates. A primary information source for data on the status of CSO abatement projects will probably be 201 and 208 reports. It must be emphasized at the outset that the information contained in these documents should be reported only if CSO control was identified in the scope of work for the 201 and 208. That is, planning documents for combined sewer systems or for WWTP's serving combined sewer systems which do not propose solutions for CSO pollution (Category V) should not be reported on the CSO worksheet.

Information which was collected for the combined sewer system data file as part of past Needs Surveys will be preprinted on the 1982 combined sewer system worksheets. The 1982 data collection effort should update and verify these existing data as well as report new data items. All corrections should be shown on these data sheets. There are no changes in the CSO worksheet format or field data elements for 1982. That is, the 1982 CSO worksheet is identical to the 1980 CSO worksheet.

The 1982 CSO field data collection effort should concentrate on Section 1 (Identification and Combined Sewer System data), Section 3 (Status of CSO abatement projects) and Section 5 (Grant-eligible cost estimates). Section 2 (Receiving Water Characteristics) will be enhanced and updated after the field data collection effort is complete by ADP techniques utilizing Reach File and EPA-1 file cross-references. For the case where a worksheet has not been preprinted for an existing combined sewer system (i.e., not reported in 1980), a new worksheet should be filled out. Details on how to complete each item of the worksheet are presented in this guidance.

Relationship to EPA-1 Form

The combined sewer system data file worksheet (CSO worksheet) is supplemental to the EPA-1 form and is to be completed when Category V needs are applicable to a given facility or group of facilities. A sample worksheet is shown on page 58. Category V needs apply only to combined sewer collection networks or to facilities which serve combined sewer collection networks. When Item No. 16(b) (Nature of Facility) of the EPA-1 form is coded as a (1) or (5), then combined sewers are involved and

CONTENTS ON BACK:

YES NO

II. RECEIVING ANTENNA CHARACTERISTICS

- | | | | |
|-------------------------------|---|---|--|
| 1. AUTHORITY/FACILITY NO.: | | | |
| 2. AUTHORITY NAME: | | | |
| 3. STATE/CO./PLACE: | / | / | |
| 4. SISA NO.: | | | |
| 5. BASIN: | | | |
| 6. CONC. DIST: | | | |
| 7. CITY: | | | |
| 8. COUNTY: | | | |
| 9. COMBINED SEWER AREA: | | | |
| 10. SEPARATE SANITARY CODE: | | | |
| 11. POPULATION: | | | |
| 12. COMBINED SEWER LENGTH: | | | |
| 13. NUMBER CSO POINTS: | | | |
| 14. POPULATION EQUIVALENT: | | | |
| 15. OTHER A/F NO.(S): | | | |
| 16. LOCAL CONTACT NAME: | | | |
| 17. RW NAME: | | | |
| 18. HEAVY RAINFALL FLOW CODE: | | | |
| 19. LOW FLOW CODE: | | | |
| 20. RW CLASSIFICATION: | | | |
| 21. KNOWN REAURATION RATE: | | | |
| 21.1/DAY (BASE E) FLOW: | | | |
| 22. CHANNEL SLOPE: | | | |
| 23. RW QUALITY | | | |
| HAX MONTHLY TEMP: | | | |
| AVE. SS: | | | |
| AVE. FECAL COLIFORM: | | | |
| 24. USGS GAGE NO.: | | | |
| 25. AQUATIC LIFE: | | | |
| 26. KNOWN CSO PROBLEMS: | | | |

27.OVERALL STATUS:

- [illegible]

32. GRANT NUMBER(S):

V. GRANT ELIGIBLE COST ESTIMATES (IN THOUSANDS OF DOLLARS)

33. COST ESTIMATES

[illegible]

the facility must be reported on a CSO worksheet. Each authority/facility number reported as a Code (1) or (5) on Item No. 16(b) of the EPA-1 form must also be accounted for in either Item No. (1) or Item No. (15) of the applicable CSO worksheet. Criteria for determining the proper place for reporting the Authority/Facility Number is discussed in the following sections of the guidance.

Worksheets Defined--Hydrologic Basis

Because of the dual role provided by combined sewer systems, i.e., urban drainage and wastewater conveyance, they cannot be entirely defined on a facility-by-facility basis but must be defined by hydrologic or areawide planning considerations. For this reason, a separate worksheet must be completed for each combined sewer system/major receiving water combination. One worksheet should cover more than one combined sewer network (i.e., facility) if the networks are adjacent and discharge to the same major receiving water. Thus, a single worksheet may cover any number of overflow points or facilities on either side of a given receiving water as long as they are located in the same general area (i.e., same city or urbanized area) and discharge to a single receiving water. A single worksheet may also cover a number of facilities which are included in a single CSO planning document.

Receiving Water Defined

A single worksheet should be filled out for each combined sewer system/major receiving water combination. If a combined sewer system discharges directly to a lake, ocean, estuary, or large river, then the major receiving water is obvious. However, a problem may arise when CSO occurs on urban streams which feed large rivers. In this case, an urban stream should be entered on a CSO worksheet only if it is a continuously flowing stream which could become fishable and swimmable after providing adequate control of CSO. In general, two types of urban streams are of concern when filing out the worksheets. They are inner city streams and urban receiving streams.

Inner city streams may be intermittent or continuously flowing; however, due to urban and/or industrial activities, they are for all practical purposes part of the urban stormwater collection system. These streams may be covered and flow underground through downtown business districts, commercial areas, or industrial areas. As a result, it is not practical to consider these as major receiving waters since they probably could not be made fishable or swimmable under any level of pollution control.

An urban receiving stream can be considered a major receiving water if it is a continuously flowing water body which could become fishable and swimmable after providing adequate control of CSO and/or other pollution sources. The area of a combined sewer watershed tributary to an urban receiving stream should typically be small when compared to the upstream drainage area of the stream.

Status of Combined Sewer Pollution Abatement Projects

An unknown number of municipalities have initiated and/or completed planning, design, and construction of facilities to control CSO. A major emphasis of the 1982 survey is to identify those municipalities which have conducted CSO planning and to perform an assessment of that planning to determine compliance with EPA guidance published in Municipal Wastewater Treatment Facilities Planning (FRD-20, March, 1981). Section 3 of the 1982 combined sewer system worksheet has been developed for this task, and is described in further detail elsewhere in this guidance.

Details of the EPA guidance may be found in a recent EPA publication entitled "Benefit Analysis For Combined Sewer Overflow Control," EPA-625/4-79-013 (April 1979), published by the EPA Environmental Research Information Center, Cincinnati, Ohio. This document should be studied by the regional engineers and staff engineers before beginning review of CSO facilities planning documents.

Major combined sewer systems, which should receive priority consideration when completing Section 3 of the worksheets, are those systems located within the Urbanized Areas listed in the table on page 61. These Urbanized Areas account for approximately 2/3 of the total national Category V needs.

A total of 56 CSO planning documents for 22 major urban areas were reviewed by CH₂M Hill as part of the 1980 Needs Survey. Urbanized Areas for which CSO planning documents were reviewed in 1980 are listed below:

New York, New York	Atlanta, Georgia
New York City Metro, New Jersey	Portland, Oregon
Chicago, Illinois	Nashville, Tennessee
Philadelphia, Pennsylvania	New Haven, Connecticut
Syracuse, New York	Akron, Ohio
Boston, Massachusetts	Spokane, Washington
San Francisco, California	Bridgeport, Connecticut
Seattle, Washington	Omaha, Nebraska
Washington, D.C.	Topeka, Kansas
Rochester, New York	Augusta, Georgia
Minneapolis-St. Paul, Minnesota	Saginaw, Michigan

An eight page (+) summary of the status of CSO planning for each of these Urbanized Areas has been prepared. Copies are available in the Denver office of URS. Preparation of additional CSO facilities planning summaries for other major urban areas is not part of the 1982 Needs Survey scope of work. Therefore, an assessment or update of the status of planning for all combined sewer systems is the responsibility of the individual completing the CSO worksheet.

URBANIZED AREAS SERVED BY CSO's

NAME	WATER	NAME	WATER
HUFFALO NY	RIVER	PROVIDENCE RI	ESTUARY
HARRISBURG PA	RIVER	DAYTON OH	RIVER
LAFAYETTE IN	RIVER	PHILADELPHIA MTR NJ	ESTUARY
DES MOINES IA	STREAM	OWENSHORO KY	RIVER
PITTSBURG PA	RIVER	LOUISVILLE KY	RIVER
ST CLOUD MN	RIVER	ST LOUIS METRO IL	RIVER
COLUMBUS OH	STREAM	EVANSVILLE IN	RIVER
STEUBENVILLE OH	RIVER	ALTON IL	RIVER
TOPEKA KS	RIVER	CINCINNATI OH	RIVER
SPRINGFIELD IL	STREAM	DAVENPORT IA	RIVER
TRENTON NJ	STREAM	NEWPORT NEWS VA	ESTUARY
AURORA IL	RIVER	NORWALK CT	ESTUARY
CHICAGO METRO IN	STREAM	WASHINGTON DC	ESTUARY
JOLIET IL	STREAM	SEATTLE WA	ESTUARY
DECATUR IL	RIVER	CHATTANOOGA TN	RIVER
LYNCHBURG VA	RIVER	KANSAS CITY MO	RIVER
FORT WAYNE IN	RIVER	KANSAS CITY METRO KS	RIVER
CHARLESTON WV	RIVER	NASHVILLE TN	RIVER
BLOOMINGTON IL	STREAM	PEORIA IL	RIVER
SPRINGFIELD OH	STREAM	OMAHA NE	RIVER
SOUTH BEND IN	RIVER	ST JOSEPH MO	RIVER
MUNCIE IN	STREAM	BEAUMONT TX	RIVER
TOLEDO OH	STREAM	HUNTINGTON METRO OH	RIVER
ANDERSON IN	RIVER	ATLANTA GA	RIVER
ALTOONA PA	STREAM	TERRA HAUTE IN	RIVER
SIOUX FALLS SD	RIVER	SAVANNAH GA	ESTUARY
SPRINGFIELD MA	RIVER	HUNTINGTON WV	RIVER
AKRON OH	STREAM	MINNEAPOLIS MN	RIVER
SOUTH BEND METRO MI	RIVER	DETROIT MI	RIVER
FLINT MI	STREAM	WHEELING WV	RIVER
NEW LONDON-NORWICH C	ESTUARY	WHEELING METRO OH	RIVER
HARTFORD CT	RIVER	ALBANY GA	RIVER
LIMA OH	STREAM	STEUBENVILLE MTR WV	RIVER
SAGINAW MI	STREAM	COLUMBUS GA	RIVER
GRAND RAPIDS MI	STREAM	AUGUSTA GA	RIVER
YOUNGSTOWN OH	STREAM	INDIANAPOLIS IN	RIVER
SCRANTON PA	RIVER	RICHMOND VA	RIVER
ALLENTOWN PA	RIVER	LEWISTON-AUBURN ME	RIVER
LAWRENCE MA	STREAM	FITCHBURG MA	STREAM
LANCASTER PA	STREAM	FARGO ND	RIVER
ROCHESTER NY	STREAM	WATERBURY CT	STREAM
LOHAIN-ELYRIA OH	RIVER	PORTLAND OR	RIVER
ALBANY NY	RIVER	ELMHURST NY	RIVER
MANCHESTER NH	RIVER	PORTLAND METRO WA	RIVER
NASHUA NH	RIVER	SPOKANE WA	RIVER
BINGHAMPTON NY	STREAM	SALEM OR	RIVER
SACRAMENTO CA	RIVER	PUEBLO CO	STREAM
LANSING MI	STREAM	BRIDGEPORT CT	OCEAN
POUGHKEEPSIE NY	RIVER	PORTLAND ME	OCEAN
UTICA-ROME NY	RIVER	SYRACUSE NY	LAKE
WORCESTER MA	STREAM	BAY CITY MI	LAKE
CHICAGO IL	RIVER	CLEVELAND OH	LAKE
ERIE PA	ESTUARY	DULUTH METRO WI	LAKE
SAN FRANCISCO CA	ESTUARY	KENOSHA WI	LAKE
MILWAUKEE WI	RIVER	OSHKOSH WI	LAKE
NEW HAVEN CT	ESTUARY	RACINE WI	LAKE
TACOMA WA	ESTUARY		
SAN JUAN PR	ESTUARY		
NEW YORK CITY NY	ESTUARY		
NEW YORK CITY MTR NJ	ESTUARY		
FALL RIVER MA	ESTUARY		
PHILADELPHIA PA	ESTUARY		
BOSTON MA	ESTUARY		
WILMINGTON DE	ESTUARY		
ST LOUIS MO	RIVER		

The regional engineer should be familiar with the existing CSO facilities plans reviews for his region before beginning the 1982 CSO data collection effort. Each of the existing CSO summaries lists the planning documents reviewed by CH₂M Hill in preparation of the summary report. If these planning documents are encountered in the field they should not be reviewed since data from these documents has been incorporated into the 1980 CSO data of record. However if new documents are found they should be reviewed in the field and the appropriate status of planning and grant eligible cost estimate information recorded on the 1982 CSO worksheet.

Information contained in CSO planning documents may be useful in other phases of the project such as in the review and updating of cost functions for CSO control technologies. Therefore, if extra copies of new CSO planning documents are available they should be sent to:

Betty Newton
CH₂M Hill
P.O. Box 1647
Gainesville, Florida 32602

COMBINED SEWER SYSTEM WORKSHEET--1982 NEEDS SURVEY

Section 1--Identification and Combined Sewer System Data

Section 1 of the worksheets provides identification and descriptive data on the combined sewer system. Information which was collected as part of the 1980 Needs Survey has been preprinted on the worksheets. These data should be verified and updated to indicate any changes or errors in the data reported. A description of each item in Section 1 follows:

1. Authority/Facility Number--The authority/facility number is defined in the Guidance for Categories I-IV. The number reported in this item should be for the major facility serving the combined sewer system. If more than one facility is involved, the additional A/F numbers will be reported in Item No. 15.
2. Authority Name--The authority name is the official name of the authority with major responsibility for operation of the combined sewer system. If the field provided (20 characters) is too small to accept the entire name, use abbreviations and report the full name in comments on back of worksheet.
3. State, County, Place--The state, county, place code is defined in the Guidance for Categories I-IV. This code should apply to the facility reported in Item No. 1.

4. SMSA Number--Those combined sewer systems located at least in part within a standard metropolitan statistical area (SMSA) as defined by the U.S. Census Bureau are reported by SMSA number in this item. The SMSA number was subject to extensive editing and quality assurance during the 1980 Needs Survey. Therefore, if this item is changed in the field it must also be changed on the corresponding EPA-1 form.
5. Basin--No changes should be made to this item in the 1982 Needs Survey. The Basin Code will be replaced by the appropriate reach number after the field data collection effort is complete. This will be accomplished by ADP techniques utilizing information contained on the EPA-1 file.
6. Congressional District--Record the number of the congressional district(s) (three maximum) which are served by the combined sewer system.
7. City Name--The city name is the official name of the city or town served by the combined sewer system. If the field provided (25 characters) is too small to accept the entire name, use abbreviations and report the full name in comments on back of worksheet.
8. County Name--The county name is the official name of the county or county equivalent in which the major portion of the combined sewer system is located. If the field provided (20 characters) is too small to accept the entire name, use abbreviations and report the full name in comments on back of worksheet.
9. Drainage Area--Enter the area, in acres, drained directly by the combined sewer system which is tributary to the subject receiving water.
10. Separate Sewer Area--This is the area, in acres, served by separate sanitary sewers which discharge directly into the combined sewer system. Codes for Item No. 10 are as follows:
 - 0 - No information presently available
 - 1 - Some separate sanitary sewers are connected; however, the area is unknown.
 - 2 - Area is known and is reported.

Note that a code of 2 and a reported area of 0.0 will be interpreted to mean that no separate sanitary sewers discharge directly into the combined sewer system.

11. Population Served--Enter the total number of people resident to the area drained directly by the combined sewer system defined in Items No. 9 and 10. In general, population densities will range from 5 to 75 persons per acre. If reported values fall outside this range, the information source should be documented in the comments on back of worksheet.
12. Sewer Length--Enter the total of combined sewer, in feet, tributary to the subject receiving water. In general, total combined sewer lengths will range between 50 and 350 feet per acre. If reported values fall outside this range, the information source should be documented in the comments on back of worksheet.
13. Number of CSO Points--This is the number of points at which the combined wastewater/stormwater is discharged for the collection system directly into the receiving water during periods of high flow.
14. Population Equivalent--This is the dry-weather flow population equivalent for the combined sewer area defined on a BOD basis and includes the resident population (Item 11), commercial contribution, existing industrial contribution, and transient population. Population equivalent should be computed on the basis of 0.20 lbs BOD₅ per person per day.
15. Additional Authority/Facility Number(s)--Since combined sewer systems may be defined using hydrologic or previous planning considerations, data for several treatment facilities may be reported on one worksheet. This item is for reporting all authority/facility numbers which are associated with the major facility serving a combined sewer system.

Space on the worksheet and data file is provided for up to 10 additional authority/facility (A/F) numbers. If a worksheet covers more than 10 additional facilities, then the first nine A/F numbers should be entered on the worksheet and the tenth field should be coded as 990000000. This code will be used to indicate that there are more than 10 additional A/F numbers and that some do not appear on the data file. All additional A/F numbers not reported in the 10 fields provided on the worksheet should be reported in the comments on the back of worksheet.
16. Local Contact--This item will report the name, title, address, and phone number of the public works official responsible for operation of the combined sewer facility.

Section 2--Receiving Water Characteristics

A single worksheet should be filled out for each combined sewer system/major receiving water combination. A major receiving water has been defined previously. Again, information which was collected for the 1980 survey has been preprinted on the worksheets. These data should be verified and updated to indicate any changes or errors in the data reported. A description of each item in Section 2 follows:

17. Name of Receiving Water--Enter the common name of the receiving water, such as "Rock Creek." If the field provided is too small (21 characters) to accept the entire name, use abbreviations and report the full name in comments on back of worksheet.
- 18/19. Mean Annual Flow and 7/0/10--Enter the average flow rate and 7-day, 10-year low flow rate of the receiving water, in cubic feet per second (cfs). Ideally, the receiving water flow should be measured at the upstream boundary of the combined sewer area. However, flow measurements or estimates near this point are acceptable. This information should be available from the U.S. Geological Survey. Codes for Items No. 18 and 19 are as follows:
 - 0 - Flow rate not applicable, e.g., lake
 - 1 - Flow rate measured at USGS gauge.
 - 2 - Flow rate estimated from regional relationship.

In most cases, the local office of the U.S. Geological Survey will provide flow records or general flow studies for rivers within its jurisdiction. These records provide information sufficient to establish mean and low flow conditions within the context of this survey.

Typical generalized mean and low flow data for selected states are reported below. Flow units are given as cfs per square mile of watershed.

<u>State</u>	<u>Mean Flow (cfs/mi²)</u>	<u>7-Day, 10-year Low Flow (cfs/mi²)</u>
Iowa	0.407	0.0155
Missouri	0.81	0.0615
Tennessee	1.58	0.1400
Virginia	1.0	0.0468
Montana	1.170	0.118
Wyoming	0.935	0.118
Michigan	0.765	0.186

20. Receiving Water Type (Classification)--The purpose of the receiving water type is to describe the general characteristics of the receiving water. A verbal description is used to place the receiving water in one of 15 separate categories. Values and ranges of depth and/or velocity are given on the following code reference chart to guide in the selection of the proper category. Depths and velocities are mean values and apply to mean flow conditions.

Receiving water type codes:

- 1 - Creeks and shallow streams [depth (d) < 2 feet].
- 2 - Upstream feeders ($2 < d < 5$).
- 3 - Intermediate channels ($5 < d < 10$).
- 4 - Main drainage rivers ($10 < d < 20$).
- 5 - Large rivers ($20 < d < 30$).
- 6 - Impounded rivers (flow controlled or depth 30 feet).
- 7 - Small ponds, backwaters.
- 8 - Lakes.
- 9 - Shallow high tidal velocity estuary or bay (depth < 10 feet, $V > 1.5$ fps).
- 10 - Shallow, low tidal velocity estuary or bay (depth < 10 feet, $V < 1.5$ fps).
- 11 - Medium depth, high tidal velocity estuary or bay (depth = 10 to 30 feet, $V > 1.5$ fps).
- 12 - Medium depth, low tidal velocity estuary or bay (depth = 10 to 30 feet, $V < 1.5$ fps).
- 13 - Deep, high tidal velocity estuary or bay (depth > 30 feet, $V < 1.5$ fps).
- 14 - Deep, low tidal velocity estuary or bay (depth > 30 feet, $V < 1.5$ fps).
- 15 - Open ocean or beach.

This item (No. 20) will be expanded as part of the 1982 Needs Survey to include not only the receiving water type defined above but also the receiving water use as defined in the guidance for categories I-IV. However this information will be added to the CSO file by ADP techniques utilizing data reported on the EPA-1 form. Therefore a separate field effort or verification will not be required as part of the Category V data collection task.

21. Known Reaeration Coefficient--If a reaeration rate for the subject receiving water has been measured, enter the value and the flow rate at which the measurement was made. Units of the reaeration rate are per day base.
22. Channel Slope--This is the approximate receiving stream slope, reported in feet per mile. This information can be estimated from USGS topographic maps. This item need not be reported if Item No. 21 is completed, and applies only to free-flowing streams (receiving water classification 1 through 5).
23. Receiving Water Background Quality--These background quality data should correspond to upstream flow of the major receiving water prior to impact from the combined sewer system. USGS Water Quality records may be a source for this information. Data on the following parameters are required:
 - Maximum mean monthly temperature, in °C (generally occurs in July or August).
 - Average BOD₅ concentration, in mg/l.
 - Average SS concentration, in mg/l.
 - Average fecal coliform concentration, in MPN/100 ml.
24. USGS Gage Number--If receiving water flow estimates reported in Items No. 18 and 19 are derived directly from USGS flow records, enter the station identification number.
25. Type of Aquatic Life--Enter the type of aquatic life which could reasonably be supported under unpolluted or uncontaminated conditions in the receiving water downstream from the combined sewer system. Codes which apply to this item are defined as follows:
 - 1 - Cold freshwater fishery, e.g., trout.
 - 2 - Cold freshwater nursery or breeding area.
 - 3 - Warm freshwater fishery, e.g., black bass.
 - 4 - Warm freshwater nursery or breeding area.
 - 5 - Estuary nonshellfish waters.
 - 6 - Estuary shellfish waters.
 - 7 - Open ocean.
26. Known CSO Problems--Enter water quality problems associated with the receiving water downstream from the combined sewer area which are known to be caused at least in part by combined sewer overflow. Codes are defined as follows:

- 0 - No known problems.
- 1 - Asthetic degradation.
- 2 - High suspended solids levels.
- 3 - Low dissolved oxygen levels.
- 4 - Bacteriological contamination.
- 5 - Sludge deposits.
- 6 - Toxic conditions.
- 7 - Fishkills.
- 8 - Eutrophication (nutrients).
- 9 - Other, see comments.

Up to four known CSO problems may be entered and should be listed in decreasing order of severity.

Section 3--Status of CSO Abatement Projects

The general procedure for completing Section 3 of the worksheets was described in the introductory material of this guidance.

27. Overall Status--Determine the overall status of CSO abatement projects for the combined sewer system described on this worksheet. The following codes are used to designate CSO project status:
- 1. Planning not yet begun.
 - 2. Ongoing 208.
 - 3. Draft 208.
 - 4. Completed 208.
 - 5. Ongoing 201 (Step 1)
 - 6. Draft 201.
 - 7. Completed 201.
 - 8. Ongoing CSO planning, non-EPA funded.
 - 9. Draft CSO planning, non-EPA funded.

10. Completed CSO planning, non-EPA funded.
11. Ongoing design (Step 2).
12. Completed design.
13. Construction in progress.
14. Construction complete.

More than one code may apply to any given facility. For example, a facility may have been included in a completed 208 (Code 4) and is currently being studied by an ongoing 201 (Code 5). Both should be reported. It is important to note that only those planning projects which address CSO (Category V) should be reported. A facilities plan which covers only dry-weather flow is not to be reported on this worksheet.

28. Completion Dates--For each of the codes entered above, the actual or expected completion dates will be recorded in a table, as follows:

<u>Completion Date</u>		
<u>Code</u>	<u>Month</u>	<u>Year</u>

These completion dates will play an important role in the continuous updating of the data base. Periodically the data base can be searched for actions which should have been completed and the associated facility numbers listed. The responsible public works official (reported in Item No. 16) will then be contacted to determine whether or not the anticipated milestone was actually reached. If the milestone was reached, the data base will be updated and copies of pertinent document (if any) requested for review.

29. Planning Approach--To determine if current CSO facility planning is complete, comprehensive and complies with EPA guidance, the following items should be identified from CSO planning documents when a Code 3 and/or Code 5 is entered under Item 27. If the following points were addressed, a Code 1 is entered for each point. If it was not addressed, a Code 2 is entered.
 - a. Receiving water quality objectives were defined. Existing water quality impacts documented.
 - b. Residual water quality problems were identified (i.e., the existence of a receiving water quality problem after achievement of the secondary treatment requirement was established).

- c. Pollutant removal requirements were estimated.
- d. Alternate CSO control techniques were identified.
- e. A cost-effective mix of CSO alternatives was considered.
- f. A cost-effective mix of CSO, AWT, and/or other control measures was considered.
- g. Marginal costs were determined not to be substantially greater than marginal benefits for the proposed solution.
- 30. Multipurpose Projects--The objective of Item 30 is to determine if a CSO project has purposes other than pollution control (e.g., flood control or drainage). The results of Item 30 are reported for the following three points by using a Code 1 if the point is negative and a Code 2 if the point is affirmative.
 - a. Does the CSO abatement project have purposes other than pollution control (e.g., flood control or drainage)?
 - b. The cost allocated to CSO pollution control was determined by the alternative justifiable expenditure (AJE) method.
 - c. The cost allocated to CSO pollution control does not exceed the least cost single purpose CSO pollution control alternative.
- 31. Proposed Solutions--If Codes 3, 5, or 7 are entered under Item No. 27 and if the resulting draft or completed documents are available for review, the proposed solutions for control of CSO (five maximum) should be reported using the following codes:
 - 1. Sewer separation.
 - 2. Storage/treatment system.
 - 3. Screening options (e.g. coarse screens, micro screens, high rate filtration).
 - 4. In-system storage.
 - 5. In-system storage with real-time control.
 - 6. Surface-water interception/storage/diversion scheme (i.e., runoff diverted before entering a combined sewer system).
 - 7. Sewer flushing.
 - 8. Catch basin cleaning.

9. Streetsweeping.
10. Other, see comments.
11. Other treatment without storage.
12. Chlorination.
20. Cost-effective mix of CSO alternatives.
21. Cost-effective mix of CSO, AST, AWT, and/or other control measures.

Note: If Codes 20 and 21 are entered, please describe on back of worksheet the components of the cost-effective mix.

Section 4-- Grant Information

32. Grant Numbers--Grant numbers, if any, which provide Federal construction grant funds for CSO control (i.e., Category V) should be entered here.

Section 5-- Grant-Eligible Cost Estimates

33. Cost Estimates--For each of the proposed CSO solutions identified in Item No. 31, a cost estimate should be entered, when available, along with the month and year used to establish the value of money when the estimate was made.

The following codes should be used for reporting cost estimates of proposed solutions:

1. Sewer separation.
2. Storage/treatment system.
3. High-rate treatment without storage (e.g., swirl concentrator).
4. In-system storage.
5. In-system storage with real-time control.
6. Surface-water interception/storage/diversion scheme.
7. Sewer flushing.
8. Catch basin cleaning.
9. Streetsweeping.

10. Other, see comments.
11. Other treatment without storage.
12. Chlorination.
19. State-supplied (separate) estimate.
20. Cost-effective mix of CSO alternatives.
21. Cost-effective mix of CSO, AST, AWT, and/or other measures.
22. Aesthetics objective (NEP).
23. Aesthetics/Public Health objective (NEP).
24. Fish and wildlife objective (NEP).
25. Recreation objective (NEP).
26. Sewer separation (NEP).
27. Needs previously met.
28. Needs reported to Congress.

The needs previously met should be established in the field from grant information. Needs reported to Congress and Codes 22, 23, 24, and 25 will be filled out by CH2M HILL.

General Comment--The 1982 Needs Survey is the third iterations on the CSO data file. Therefore it is anticipated that there will be a large number of worksheets which will not require changes in any of the data items. For these facilities please write "NO CHANGE: across the front of the worksheet before forwarding to CH2M Hill for processing. This procedure will assure an exact accounting of all worksheets.

APPENDIX A

COST ESTIMATING PROCEDURES
1982 NEEDS SURVEY

INTRODUCTION

Construction cost estimating procedures for treatment facilities and sanitary sewers have been developed by EPA for use in the 1982 Needs Survey. These procedures are to be used only in the absence of more accurate, facility-specific cost information. All estimates developed using these EPA cost estimating procedures will reflect January 1, 1981 dollars and will be reported with a basis of estimate Code 7 in Item 17d on the EPA-1 form.

WASTEWATER TREATMENT FACILITIES

General

For purposes of estimating the total construction cost of complete wastewater treatment facilities, Figures A.1 through A.4 are to be utilized. To estimate the total construction cost of adding a filtration unit process or a chlorination unit process to a treatment facility, Figures A.5 and A.6 are to be used. All the curves illustrated in Figures A.1 through A.6 include allowances for Step 1, Step 2, and Step 3 nonconstruction items and represent the average grant eligible costs for complete facilities.

When determining the construction cost of a facility using a curve, it is suggested that the equation for the curve be used to find the cost instead of determining cost from the graph. To use the equation of the curve, substitute the design flow of the facility, in million gallons per day (mgd), for "Q." The equations for each curve are listed on the lower right hand side of each figure.

For communities with a population less than or equal to 3,500 that do not presently have a central wastewater treatment facility, the use of a lagoon treatment facility must be considered. If a lagoon facility is capable of producing an effluent that will satisfy the established water quality standards, then Figure A.4 should be used to estimate the needs.

For communities with a population less than 225 that do not presently have a central wastewater treatment facility, the use of individual on-site systems must be considered. If the soils in the area are suitable for on-site disposal, then no central facility will be allowed.

Area Multipliers

Table A.1 provides a list of multipliers that are to be applied to costs developed using Figures A.1 through A.6 and the on-site system allowance. These multipliers reflect variations in construction costs due to regional

labor and material cost differences. Map 1 delineates the boundaries for each of the 25 area multipliers that are utilized throughout the continental United States. Also included on Table A.1 are multipliers to be used for States and Territories outside the continental United States.

Figure A.1

This figure is to be used to determine the costs for the construction of new mechanical wastewater treatment facilities with a level of treatment considered to be secondary or secondary with nutrient removal. This figure also is used to determine the salvage value of existing primary and secondary mechanical plants. Curve 1 represents the construction cost of a new secondary treatment facility. Secondary treatment is defined as BOD effluent concentrations between 25 and 30 mg/l, inclusive. Costs developed using Curve 1 are to be entered in Category I and a characteristic effluent Code 4 is to be entered in Item 26 on the EPA-1 form.

Curve 1A represents the construction cost of a new secondary treatment facility with nutrient removal. Nutrient removal implies the reduction of the amount of phosphorus and/or ammonia in the effluent to levels lower than would be present after normal secondary treatment. Costs developed using Curve 1A are to be split between Categories I and IIA, using procedures outlined in Appendix B. An effluent characteristic Code 5 is to be entered in Item 26 on the EPA-1 form.

Curves A and B are utilized to provide salvage values for existing primary and secondary mechanical plants, respectively.

Figure A.2

This figure is used to determine the costs for the construction of new mechanical wastewater treatment facilities with a level of treatment considered to be advanced secondary (AST) or advanced secondary with nutrient removal (AST with N.R.).

Curve 2 represents the construction cost of a new AST plant. AST treatment is defined as BOD effluent concentrations between 10 and 24 mg/l, inclusive. Costs developed using Curve 2 are to be split between Categories I and IIA, using procedures outlined in Appendix B. A characteristic of effluent Code 5 will be entered in Item 26 on the EPA-1 form.

Curve 2A represents the construction of a new AST plant with nutrient removal. Nutrient removal implies the reduction of the amount of phosphorus and/or ammonia in the effluent to levels lower than would be present after normal AST treatment. Costs developed using Curve 2A

are to be split between Categories I and IIA, using procedures outlined in Appendix B. A characteristic of effluent Code 5 will be entered in Item 26 on the EPA-1 form.

Figure A.3

This figure is to be used to determine the costs for the construction of new mechanical wastewater treatment facilities with a level of treatment considered to be advanced (AWT) or advanced with nutrient removal (AWT with N.R.). In addition, any facility with denitrification capabilities is to have its construction costs estimated using this figure.

Curve 3 represents the construction of a new AWT plant. AWT treatment is defined as BOD effluent concentrations less than 10 mg/l. Costs developed using Curve 3 are to be split between Categories I, IIA, and IIB, using procedures outlined in Appendix B. A characteristic of effluent Code 6 is to be entered in Item 26 on the EPA-1 form.

Curve 3A yields the construction cost for a new AWT plant with nutrient removal or any new plant with denitrification capabilities. Nutrient removal implies the reduction of the amount of phosphorus and/or ammonia in the effluent to levels lower than would be present after normal AWT treatment. Denitrification capability implies the ability to remove at least 50 percent of the total nitrogen present in a wastewater flow. Costs developed using Curve 3A are to be split between Categories I, IIA, and IIB, using procedures outlined in Appendix B. A characteristic of effluent Code 6 is to be entered in Item 26 on the EPA-1 form.

Figure A.4

This figure is to be used to determine the cost for the construction of new lagoon wastewater treatment facilities with a level of treatment considered to be secondary. This figure is to be used for aerated and non-aerated lagoons with effluent disposed to surface waters or operated as total containment ponds.

If the effluent disposal is to surface waters, a characteristic of effluent Code 4 is to be entered in Item 26 on the EPA-1 form. If the effluent disposal is to a total containment pond, a characteristic of effluent Code 0 will be entered in Item 26 on the EPA-1 form.

Figure A.5

This figure is to be used to determine the cost for adding a filtration unit process to a wastewater treatment facility.

Figure A.6

This figure is to be used to determine the cost for adding a chlorination unit process to a wastewater treatment facility.

Individual On-site Systems

In locations where the use of individual on-site systems is acceptable and cost effective, the construction costs will be estimated by allowing \$550 per capita. These costs will be entered in Category I. Only present residents not currently served by a central collection or treatment system are eligible for this on-site system allowance.

General Procedures for Use of Figures

The rule of thumb cost estimating procedure in general and the cost curves in particular are designed for use in situations where no planning has been done but a clearly defined need exists. The cost curves have been designed for use in five specific situations. The situations are: New Construction, Enlarging, Upgrading, Enlarging and Upgrading and two specific "Other" type changes. The specific "Other" type change is the addition of a filtration unit or a chlorination unit to an existing facility. The cost curves should not be used for other types of projected changes.

New Construction - For mechanical plants, estimate the cost for the projected level of treatment and flow from Curves 1 through 3A, as applicable, and then adjust the cost using the appropriate area multiplier from Table A.1. For lagoons providing secondary treatment, estimate the cost for the projected flow from Figure A.4. For lagoons providing a greater than secondary level of treatment, the cost can be estimated by combining the cost of the lagoon from Figure A.4 with the cost of a filtration unit from Figure A.5 at the desired design flow. After a cost has been developed, it must be adjusted using the multipliers from Table A.1.

Enlarging - For mechanical plants and lagoons, the cost is estimated by applying the change in flow to the curve which represents the present level of treatment. The change in flow is calculated by subtracting the present design flow from the projected design flow. After the cost is determined from the curve, it must be adjusted using the appropriate area multiplier from Table A.1.

Upgrading or Enlarging and Upgrading - For mechanical plants, first estimate the construction cost for the projected facility at the desired level of treatment and flow from Curves 1 through 3A, then subtract the salvage value of the existing facility. For existing primary plants, the salvage value is determined using Curve A. For existing secondary plants, the salvage value is determined using Curve B. For existing plants with greater than secondary levels of treatment, the salvage value is determined using the curve which represents the new construction cost for the particular level of treatment of the existing plant. For plants which must only upgrade their level of treatment slightly, the addition of a filtration unit should be used. Once the cost has been developed using curves, it must be adjusted using the multipliers on Table A.1. For lagoons no salvage is subtracted. The only reasonable method of estimating the cost for upgrading lagoon effluent is to find the cost for a filtration unit addition.

• Examples I through VIII illustrate specific uses of the figures, curves, and multipliers.

TABLE A.1
1982 NEEDS SURVEY
AREA MULTIPLIERS
WASTEWATER TREATMENT PLANT CONSTRUCTION

1	Atlanta, GA	0.86
2	Baltimore, MD	0.98
3	Birmingham, AL	0.85
4	Boston, MA	1.12
5	Charlotte, NC	0.71
6	Chicago, IL	1.17
7	Cincinnati, OH	1.05
8	Cleveland, OH	1.11
9	Dallas, TX	0.86
10	Denver, CO	0.94
11	Detroit, MI	1.10
12	Houston, TX	0.94
13	Kansas City, MO	1.00
14	Los Angeles, CA	1.11
15	Miami, FL	0.87
16	Milwaukee, WI	1.03
17	Minneapolis, MN	0.98
18	New Orleans, LA	0.98

TABLE A.1 (Continued)

19	New York, NY	1.30
20	Philadelphia, PA	1.14
21	Pittsburgh, PA	1.08
22	St. Louis, MO	1.15
23	San Francisco, CA	1.19
24	Seattle, WA	1.13
25	Trenton, NJ	1.06

STATE AND TERRITORIAL MULTIPLERS

Alaska	2.64
Hawaii	1.53
Puerto Rico	1.43
Virgin Island	1.43
Trust Territories	2.21

EXAMPLE I NEW CONSTRUCTION

Construct a new secondary plant in Boulder, CO according to the conditions below.

Present Design: Individual on-site systems.

Population Statistics:	<u>Present Resident</u>	<u>Present Nonresident</u>	<u>Projected Resident</u>	<u>Projected Nonresident</u>
Receiving Treatment	0	0	6,000	0
No Treatment	3,400	0	0	0

COST OF RECORD

1. $6,000 \times 105 \text{ gpcd} = 0.63 \text{ mgd}$.
2. From Figure 1, Curve 1 (Cost of 0.63 mgd secondary plant)
3. From Table A.1 (Denver area multiplier)
4. Cost Estimate, Report in Category I

\$2,142,052
x 0.94
\$2,013,529

Note: See Appendix B to determine the categories in which to enter cost estimates.

BACKLOG*

1. $3400 \times 95 \text{ gpcd} = 0.32 \text{ mgd}$.
2. From Figure 1, Curve 1 (Cost of 0.32 mgd secondary plant)
3. From Table A.1 (Denver area Multiplier)
4. Cost Estimate, Record in Category I

\$1,333,204
x 0.94
\$1,253,212

*The BACKLOG costs will be worked out for selected examples.

EXAMPLE II
NEW CONSTRUCTION

Construct a new secondary plant in Concord, MA according to the conditions below.

Present Design: Individual on-site systems.

Population Statistics:

	<u>Present Resident</u>	<u>Present Nonresident</u>	<u>Projected Resident</u>	<u>Projected Nonresident</u>
Receiving Treatment	0	0	2,500	0
No Treatment	2,000	0	1,000	0

COST OF RECORD

- | | |
|---|------------------|
| 1. Since 2,500 < 3,500, a lagoon is assumed to be proper treatment. | |
| 2. 2,500 x 95 gpcd = 0.24 mgd. | |
| 3. From Figure 4 (Cost of 0.24 lagoon) | \$706,077 |
| 4. From Table A.1 (Boston area multiplier) | x 1.12 |
| 5. Cost Estimate, Report in Category I | <u>\$790,806</u> |

EXAMPLE III
ENLARGE

Enlarge a Tacoma, WA plant according to the conditions below.

Present Design: 1.00 mgd AST plant. Item 29-A-3 = 110.55 gpcd.

Population Statistics:

	<u>Present Resident</u>	<u>Present Nonresident</u>	<u>Projected Resident</u>	<u>Projected Nonresident</u>
Receiving Treatment	12,000	1,000	25,000	1,500
No Treatment	7,500	0	0	0

COST OF RECORD

1. Since $110.55 < 115.00$, use 110.55 gpcd to determine projected capacity.
2. $25,000 \times 110.55 \text{ gpcd} + 1,500 \times 60 \text{ gpcd} = 2.85 \text{ mgd}$
3. Delta Q: $2.85 - 1.00 = 1.85 \text{ mgd}$.
4. From Figure 2, Curve 2 (Cost of 1.85 mgd AST plant) \$5,106,166
5. From Table A.1 (Seattle area multiplier) x 1.13
6. Cost Estimate, Report in Categories I and IIA \$5,769,968
7. From Table B.2,

Category I : $5,769,968 \times 0.89 =$	\$5,135,272
Category IIA: $5,769,968 \times 0.11 =$	\$ 634,696

BACKLOG

1. $19,500 \times 110.55 \text{ gpcd} + 1,000 \times 60 \text{ gpcd} = 2.22 \text{ mgd}$.
2. Delta Q: $2.22 - 1.00 = 1.22 \text{ mgd}$
3. From Figure 2, Curve 2 (Cost of 1.22 mgd AST plant) \$3,831,199
4. Seattle area multiplier. x 1.13
5. Cost Estimate, Report in Categories I and IIA \$4,329,255
6. From Table B.2,

Category I : $4,329,255 \times 0.89 =$	\$3,853,037
Category IIA: $4,329,255 \times 0.11 =$	\$ 476,218

EXAMPLE IV
UPGRADE

Upgrade a Detroit, MI plant to secondary treatment.

Present Design: 0.75 mgd in primary plant. Item 29-A-3 = 100.00 gpcd.

Population Statistics:

	<u>Present Resident</u>	<u>Present Nonresident</u>	<u>Projected Resident</u>	<u>Projected Nonresident</u>
Receiving Treatment	6,000	0	7,500	0
No Treatment	1,000	0	0	0

COST OF RECORD

- | | |
|--|------------------|
| 1. Since 100.00 < 105.00, use 100.00 gpcd to determine projected capacity. | |
| 2. 7,500 x 100.00 gpcd = 0.75 mgd. | |
| 3. From Figure 1, Curve 1 (Cost of 0.75 mgd secondary plant) | \$2,420,107 |
| 4. From Figure 1, Curve A (Deduction for existing 0.75 mgd primary plant) | <u>- 513,797</u> |
| 5. Unadjusted Cost of Upgrade. | \$1,906,310 |
| 6. From Table A.1 (Detroit area multiplier) | <u>x 1.10</u> |
| 7. Cost Estimate, Report in Category I | \$2,096,941 |

EXAMPLE V
UPGRADE

Upgrade a Baton Rouge, LA plant to advanced secondary treatment.

Present Design: 0.75 mgd secondary plant. Item 29-A-3 = 100.00 gpcd.

Population Statistics:

	<u>Present Resident</u>	<u>Present Nonresident</u>	<u>Projected Resident</u>	<u>Projected Nonresident</u>
Receiving Treatment	6,000	0	7,000	0
No Treatment	500	0	1,000	0

COST OF RECORD

- | | |
|--|--------------------|
| 1. Since 100.00 < 105.00, use 100.00 gpcd to determine projected capacity. | |
| 2. 7,000 x 100.00 gpcd = 0.70 mgd. | |
| 3. From Figure 2, Curve 2 (Cost of 0.70 mgd AST plant) | \$2,611,344 |
| 4. From Figure 1, Curve B (Deduction for existing 0.70 secondary plant) | <u>-1,056,716</u> |
| 5. Unadjusted Cost of Upgrade. | \$1,554,628 |
| 6. From Table A.1 (New Orleans area multiplier) | x 0.98 |
| 7. Cost Estimate, Report in Category IIA | <u>\$1,523,535</u> |

Note: The capacity decreases in this case. The lower projected flow is used to determine both the cost of the higher level plant and the deduction.

BACKLOG

- | | |
|---|--------------------|
| 1. 6,500 x 100.00 gpcd = 0.65 mgd. | |
| 2. From Figure 2, Curve 2 (Cost of 0.65 mgd AST plant) | \$2,481,171 |
| 3. From Figure 1, Curve B (Deduction for existing 0.65 mgd secondary plant) | <u>- 973,270</u> |
| 4. Unadjusted Cost of Upgrade | \$1,507,901 |
| 5. New Orleans area multiplier. | x 0.98 |
| 6. Cost Estimate, Report in Category IIA | <u>\$1,477,743</u> |

EXAMPLE VI
UPGRADE

Upgrade the following lagoon in Myrtle Beach, SC to advanced secondary.

Present Design: 0.08 mgd secondary lagoon. Item 29-A-3 = 84.08 gpcd.

Population Statistics:

	<u>Present Resident</u>	<u>Present Nonresident</u>	<u>Projected Resident</u>	<u>Projected Nonresident</u>
Receiving Treatment	500	0	1,000	0
No Treatment	500	0	200	0

COST OF RECORD

1. Since 84.08 < 95.00, use 84.08 gpcd to determine projected capacity.
2. 1,000 x 84.08 gpcd = 0.08 mgd.
3. From Figure 5 (Cost of Filter for 0.08 mgd plant) \$80,980
4. From Table A.1 (Charlotte area multiplier) x 0.71
5. Cost Estimate, Report in Category IIA \$57,496

Note: A filter can be used not only for lagoon upgrades from secondary to AST, but also for some mechanical plant BOD - upgrade situations -- such as AST to AST.

EXAMPLE VII
ENLARGE AND UPGRADE

Enlarge and upgrade an Annapolis, MD plant to AWT, according to the conditions below.

Present Design: 2.00 mgd AST plant. Item 29-A-3 = 123.37 gpcd.

Population Statistics:

	<u>Present Resident</u>	<u>Present Nonresident</u>	<u>Projected Resident</u>	<u>Projected Nonresident</u>
Receiving Treatment	15,000	2,000	25,000	3,000
No Treatment	1,000	250	3,000	0

COST OF RECORD

1. Since $123.37 > 115.00$, use 115.00 gpcd to determine projected capacity.
2. $25,000 \times 115.00 + 3,000 \times 60 \text{ gpcd} = 3.06 \text{ mgd}$
3. From Figure 3, Curve 3 (Cost of 3.06 mgd AWT plant) \$8,160,445
4. From Figure A, Curve 2 (Deduction for existing 2.00 mgd AST plant) -5,388,367
5. Cost of enlargement and upgrade. \$2,772,078
6. From Table A.1 (Baltimore area multiplier) x 0.98
7. Cost Estimate, Record in Categories I, IIA, and IIB = \$2,716,636
8. From Table B.4,

Category I:	$2,716,636 \times 0.80 =$	\$2,173,309
Category IIA:	$2,716,636 \times 0.10 =$	\$ 271,664
Category IIB:	$2,716,636 \times 0.10 =$	\$ 271,664

Note: Deduction value for existing AST plant is the cost of a new AST plant. This applies to any plant with level of treatment greater than secondary.

BACKLOG

1. $16,000 \times 115.00 \text{ gpcd} + 2,250 \times 60.00 \text{ gpcd} = 1.98 \text{ mgd}$.
(No backlog enlargement; $1.98 < 2.00 \text{ mgd}$.)
2. From Figure 3, Curve 3 (Cost of 1.98 mgd AWT plant) \$6,016,923
3. From Figure 2, Curve 2 (Deduction for existing 1.98 mgd AST plant) -5,351,129
4. Unadjusted Cost of Upgrade \$ 665,794
5. Baltimore area multiplier x 0.98
6. Cost Estimate, Report in Category IIB \$ 652,478

EXAMPLE VIII
ENLARGE AND UPGRADE

Enlarge and upgrade the following Green Bay, WI plant to advanced secondary with nutrient removal.

Present Design: 0.60 mgd secondary plant. Item 29-A-3 = 100.00 gpcd.

Population Statistics:

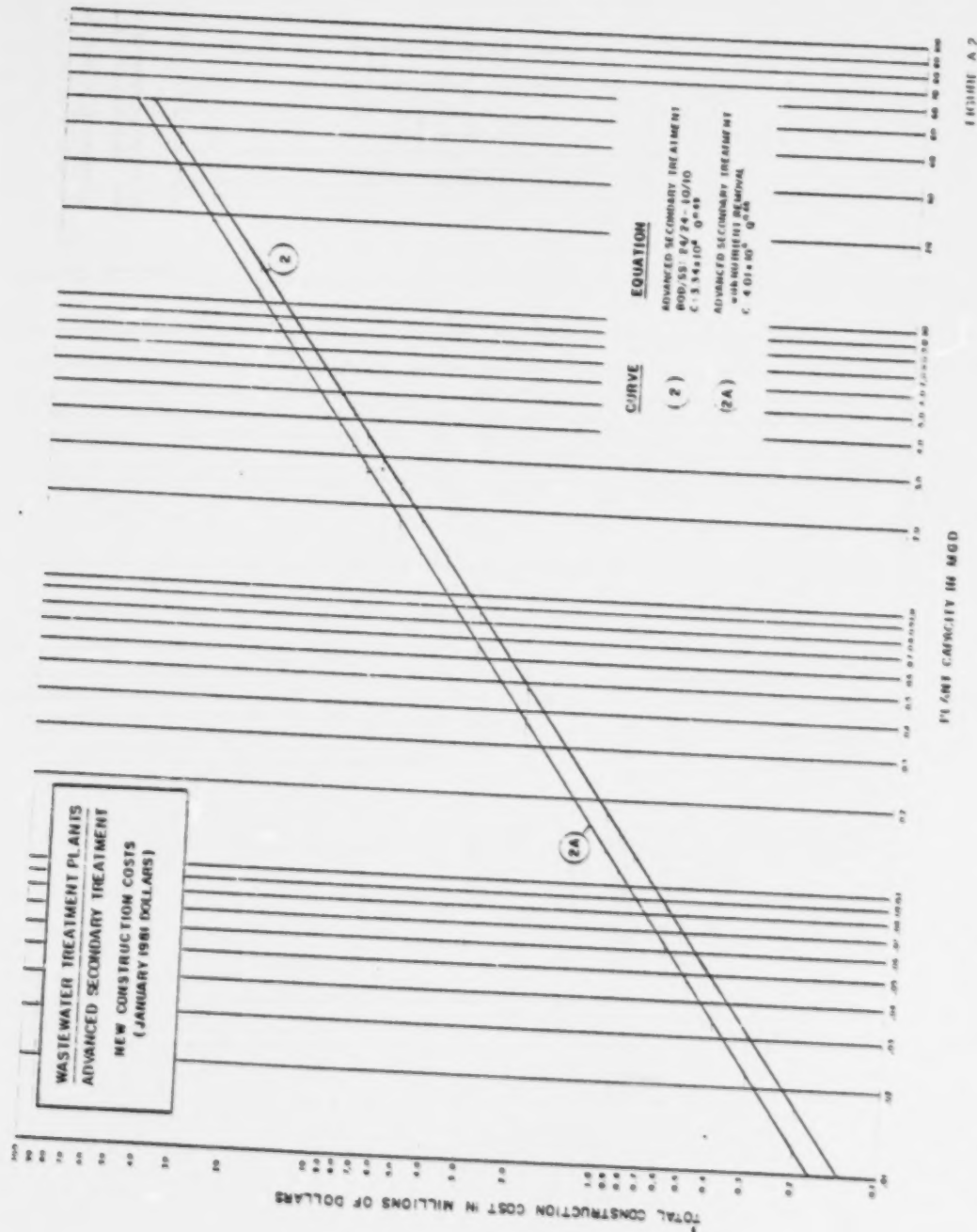
	<u>Present Resident</u>	<u>Present Nonresident</u>	<u>Projected Resident</u>	<u>Projected Nonresident</u>
Receiving Treatment	6,000	0	9,500	0
No Treatment	2,000	0	1,000	0

COST OF RECORD

1. Since 100.00 < 105.00 gpcd, use 100.00 gpcd to determine projected capacity.
2. $9,500 \times 100.00 \text{ gpcd} = 0.95 \text{ mgd}$.
3. From Figure 2, Curve 2A (Cost of 0.95 AST w/N.R. plant) \$3,872,545
4. From Figure 1, Curve B (Deduction for existing 0.60 mgd secondary plant) - 890,530
5. Unadjusted Cost of Enlargement and Upgrade. \$2,982,015
6. From Table A.1, (Milwaukee area multiplier) x 1.03
7. Cost Estimate, Report in Categories I and IIA \$3,071,476
8. From Table B.3,

Category I: $3,071,477 \times 0.72 =$	\$2,211,462
Category IIA: $3,071,477 \times 0.28 =$	\$ 860,013





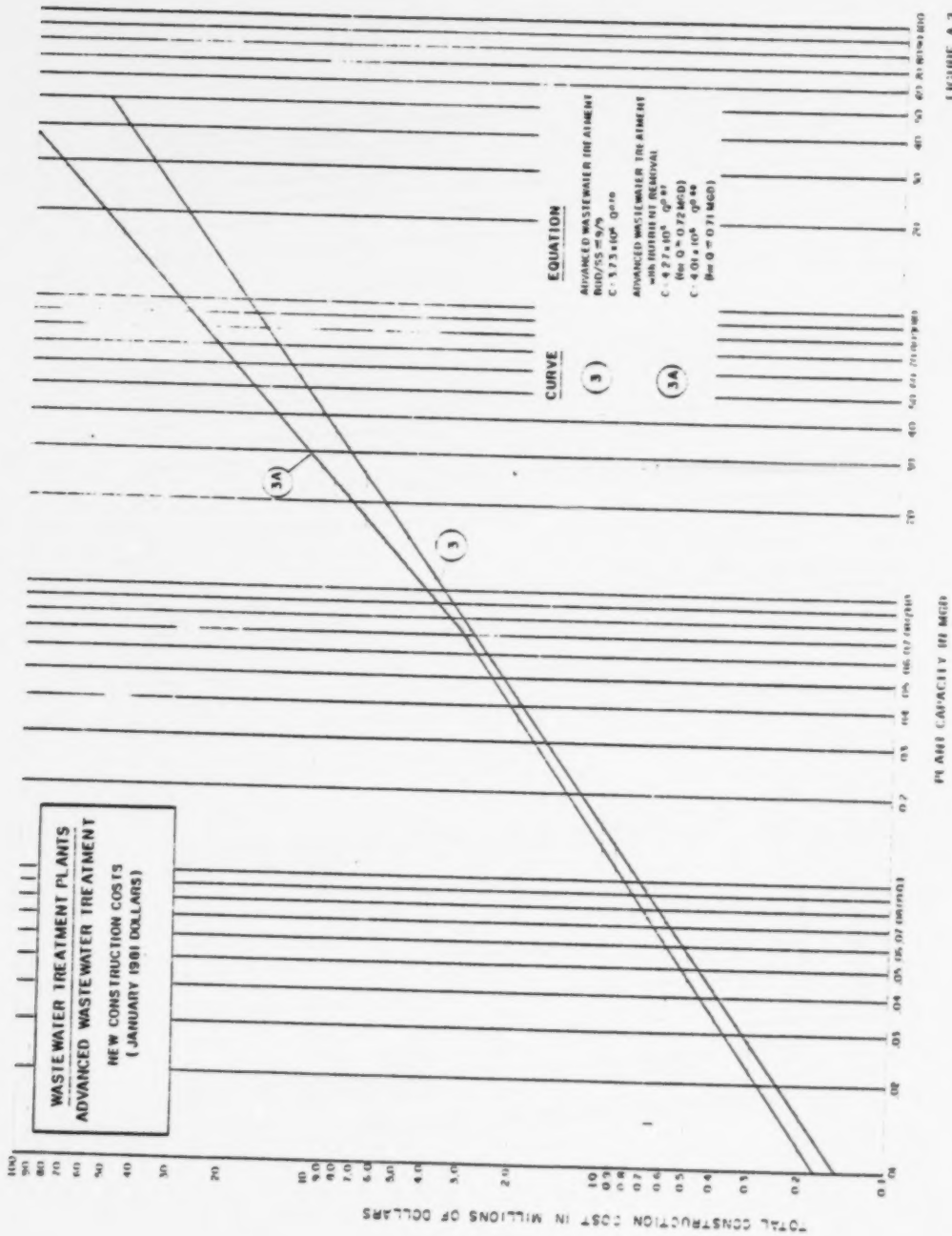


FIGURE A-3

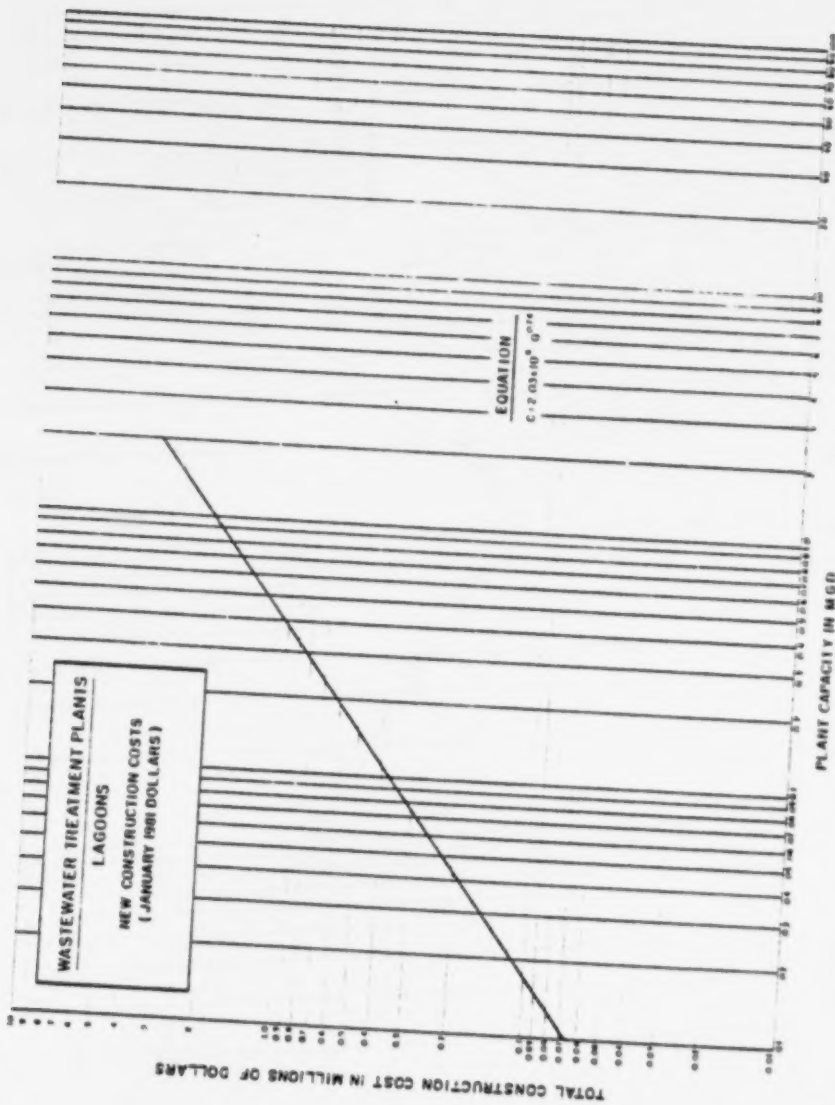
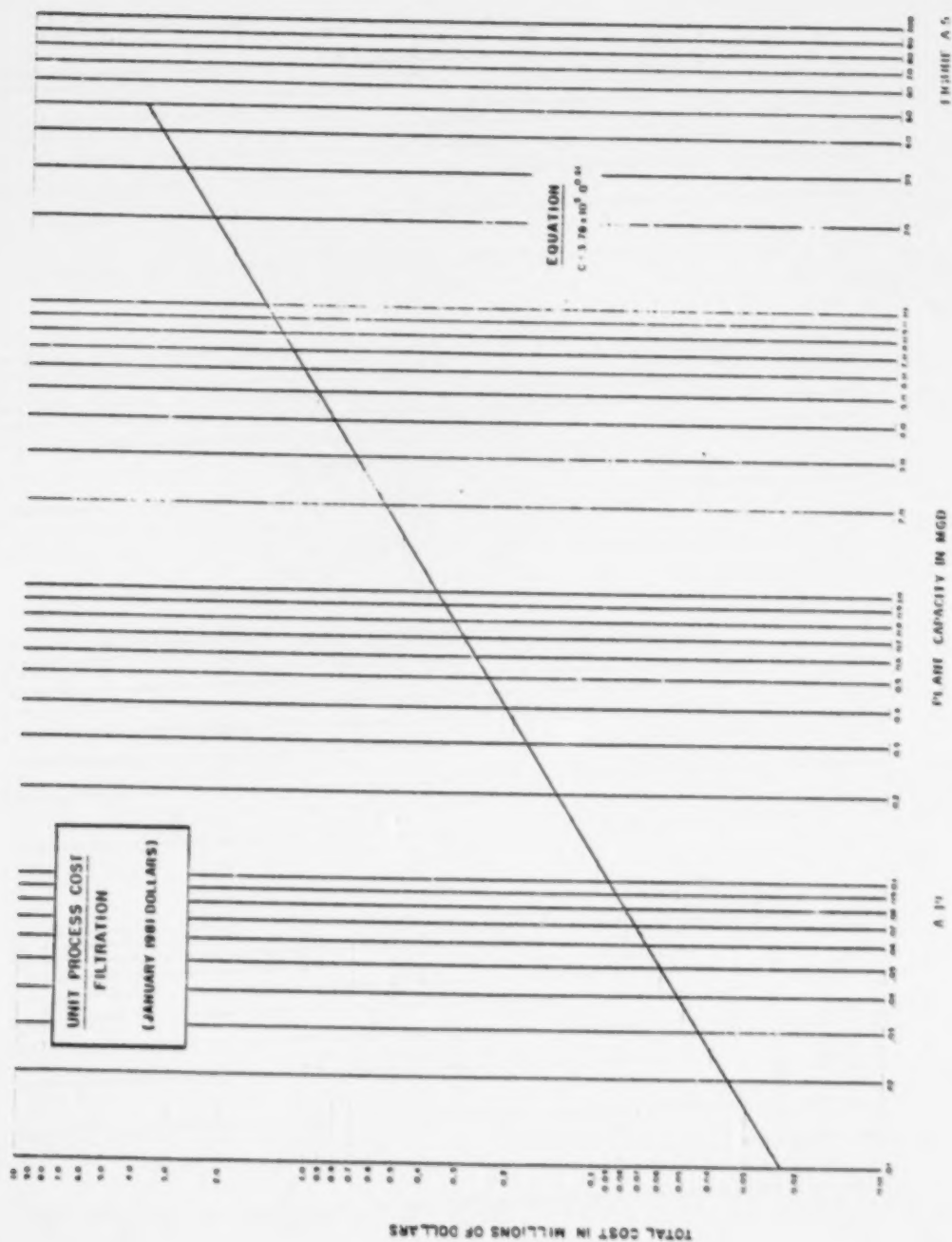
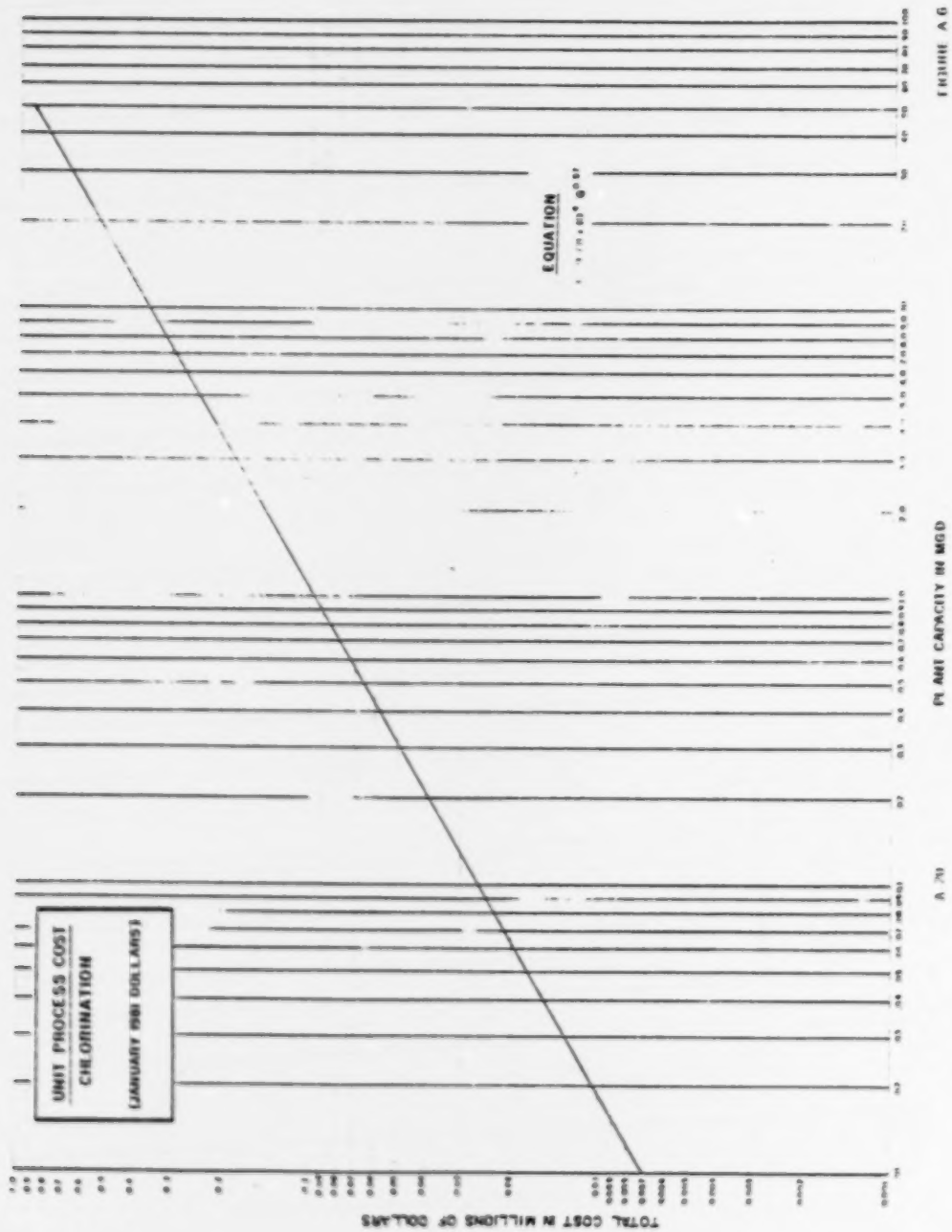


FIGURE A.4

A.111







MAP 1.

E.P.A. MUNICIPAL CONSTRUCTION COST INDEX MAP
FOR TREATMENT PLANTS AND SEWER SYSTEMS
1982 NEEDS SURVEY

SANITARY SEWER CONSTRUCTION

General

To estimate the total construction costs for sanitary sewers, information from Tables A.2 through A.6 and Map 1 will be utilized along with sewer footages determined by general rules for collectors and interceptor requirements.

Table A.2 - Sanitary Sewer Costs

Estimated construction costs for various diameter sewer pipe are presented in Table A.2. The costs are expressed in dollars per lineal foot. The costs include allowances for Step 1, Step 2, and Step 3 nonconstruction costs, as well as an allowance for all appurtenances normally associated with sewer construction.

Table A.3 - Determination of Pipe Diameter

This table is provided as an aid in determining what diameter interceptor sewer is needed to handle expected wastewater flows. A range of flows is given for each diameter pipe. The flow to be used in determining the appropriate diameter is the average daily flow expected. An allowance for peak flows has been included in the calculation of the flow ranges.

Table A.4 - Determination of Interceptor Length

This table provides the allowable lengths of interceptor sewer for various size populations. For population sizes not listed on the table, the allowable interceptor length can be calculated as follows:

1. Determine Population Density:

$$\text{Density, People/Acre} = 2.14 \times 10^{0.32} \div 0.47$$

Where X = Population, in thousands

2. Determine Area in the Service Area:

$$\text{Area, Acres} = \frac{\text{Population}}{\text{Density, People/Acre}}$$

3. Convert Acres to Square Miles:

$$\text{Area, Sq. Miles} = \frac{\text{Acre}}{640}$$

4. Find Diameter of Service Area (assume area is circular):

$$\text{Diameter (Ft.)} = \left(2 \sqrt{\frac{\text{Area (Sq. Mile)}}{\pi}} \right) \times 5,280 \text{ Ft.}$$

5. Find Allowable Interceptor Length:

$$\text{Allowable Length, Ft.} = 2/3 \times \text{Diameter, Ft.}$$

Table A.5 - Area Multipliers

This table provides a list of multipliers that will be used to compensate for local variations in sewer construction cost due to labor and material cost differences. Map 1 delineates the boundaries for each of the 25 area multipliers that will be utilized throughout the continental United States. Also included on Table A.1 are multipliers to be used for States and Territories outside the continental United States.

Table A.6 - Sanitary Sewer Cultural Multipliers

Cost adjustments due to variations in project site conditions are presented in this table. Sewer construction costs, by nature, are site-specific; therefore, the cultural multiplier from Table A.6 which most accurately describes the proposed facility location will be applied to costs obtained from previous steps. All counties in the United States have been classified as urban, suburban, or rural using Calvin Beal's Metro/Adjacency Coding System.

GENERAL PROCEDURES FOR ESTIMATING CATEGORY IVA NEEDS

The first step in estimating Category IVA needs is the determination of the population eligible to receive new collector sewers. The population entered in Item 25 on the EPA-1 form represents 2/3 of the maximum population eligible for new collector sewers. To find the exact population eligible for sewers, it is necessary to compare the maximum calculated using Item 25 with the growth population in a service area. The comparison is performed as follows:

1. Calculate Maximum Allowable Population Using Item 25 Value (X):

$$X = (\text{Item 25 Value})(1.5)$$

2. Calculate the Growth Population (Y):

$$Y = (\text{Item 18-C-3}) - (\text{Item 18-A-3})$$

3. Compare X and Y and select the smaller value.

After determining the eligible population, the length of collector needed is calculated by allowing 16 feet of collector sewer for each eligible person. After finding the length, the cost is estimated by multiplying the footage times the cost per foot (Table A.2) times the appropriate area multiplier (Table A.5) times the appropriate cultural modifier (Table A.6). The diameter of pipe to be used in finding the cost per foot is the smallest diameter sewer pipe allowed by local regulation.

Communities with a population less than 225 will not have an estimate provided for a central collection system. Communities with an Item 25 value of zero are not eligible for any Category IVA needs.

GENERAL PROCEDURES FOR ESTIMATING CATEGORY IVB NEEDS

The first step in estimating Category IVB needs is the determination of the population eligible to receive new interceptor sewers. The increase in the resident population receiving collection services is termed the growth population. The growth population represents the amount of people eligible for new interceptors. The growth population is computed with information from the EPA-1 form as follows:

$$\text{Growth Population (GP)} = (\text{Item 18-C-3}) - (\text{Item 18-A-3})$$

The next step is the determination of the total interceptor length allowable for a specific size community. The total allowable length is found on Table A.4. The population to be used in conjunction with Table A.4 is the total community population. The total community population is computed with information from the EPA-1 form as follows:

$$\text{Total Community Population (TCP)} = (\text{Item 18-C-3}) + (\text{Item 18-C-4})$$

The next step is the determination of how much of the total allowable interceptor length is needed to serve the growth population. This value is computed as follows:

$$\text{Needed Length, Ft.} = \frac{(\text{GP})}{(\text{TCP})} \times (\text{Total Allowable Interceptor Length, Ft.})$$

Where GP = Growth Population
TCP = Total Community Population

After determining the needed interceptor footage, a cost estimate can be calculated. The cost is estimated by multiplying the needed length times the cost per foot (Table A.2) times the appropriate area multiplier (Table A.5) times the appropriate cultural modifier (Table A.6). The diameter interceptor necessary to handle the average daily flow from the community is determined using Table A.3. The expected average daily flow is calculated by multiplying the number of people served by a collection system times an appropriate gallons per person per day value.

Examples IX through XII illustrate the calculations necessary to determine Category IVA and IVB needs.

TABLE A.2
1982 NEEDS SURVEY
SANITARY SEWER COSTS

<u>Pipe Diameter (Inches)</u>	<u>Average Cost* (\$/Foot)</u>
6	\$ 46
8	52
10	58
12	64
15	69
18	81
21	87
24	97
27	112
30	120
36	131
42	161
48	196
54	227
60	288
66	347
72	386

* Includes associated appurtenances and nonconstruction costs.

TABLE A.3
1982 NEEDS SURVEY
DETERMINATION OF PIPE DIAMETER

<u>Pipe Diameter (Inches)</u>	<u>Average Flow Range* (mgd)</u>
6	0.10 or Less
8	0.11 - 0.20
10	0.21 - 0.30
12	0.31 - 0.50
15	0.51 - 0.70
18	0.71 - 1.10
21	1.11 - 1.50
24	1.51 - 2.10
27	2.11 - 2.80
30	2.81 - 3.50
36	3.51 - 5.50
42	5.51 - 7.70
48	7.71 - 10.10
54	10.11 - 12.90
60	12.91 - 17.20
66	17.21 - 20.60
72	20.61 - 26.40

* An allowance is included for peak flow conditions.

TABLE A.4
1982 NEEDS SURVEY
DETERMINATION OF INTERCEPTOR LENGTH

<u>Population</u>	<u>Interceptor Length (ft)</u>	<u>Population</u>	<u>Interceptor Length (ft)</u>	<u>Population</u>	<u>Interceptor Length (ft)</u>
225	1,776	2,700	4,423	18,000	8,678
300	1,946	2,800	4,467	19,000	8,845
400	2,181	2,900	4,529	20,000	9,007
500	2,371	3,000	4,580	21,000	9,163
600	2,538	3,500	4,842	22,000	9,314
700	2,688	4,000	5,080	23,000	9,461
800	2,825	4,500	5,300	24,000	9,603
900	2,950	5,000	5,504	25,000	9,743
1,000	3,067	5,500	5,695	26,000	9,878
1,100	3,177	6,000	5,875	27,000	10,009
1,200	3,280	6,500	6,046	28,000	10,138
1,300	3,378	7,000	6,208	29,000	10,264
1,400	3,471	7,500	6,363	30,000	10,387
1,500	3,560	8,000	6,511	32,000	10,625
1,600	3,645	8,500	6,653	34,000	10,853
1,700	3,726	9,000	6,789	36,000	11,073
1,800	3,805	9,500	6,921	38,000	11,285
1,900	3,881	10,000	7,048	40,000	11,489
2,000	3,953	11,000	7,291	42,000	11,687
2,100	4,031	12,000	7,519	44,000	11,879
2,200	4,093	13,000	7,735	46,000	12,065
2,300	4,166	14,000	7,941	48,000	12,245
2,400	4,225	15,000	8,137	50,000	12,421
2,500	4,297	16,000	8,325	55,000	12,842
2,600	4,349	17,000	8,505	60,000	13,238

TABLE A.5
1982 NEEDS SURVEY
AREA MULTIPLIERS
SEWER SYSTEM CONSTRUCTION

1	Atlanta, GA	0.77
2	Baltimore, MD	0.88
3	Birmingham, AL	0.75
4	Boston, MA	1.01
5	Charlotte, NC	0.58
6	Chicago, IL	1.12
7	Cincinnati, OH	1.02
8	Cleveland, OH	1.07
9	Dallas, TX	0.67
10	Denver, CO	0.83
11	Detroit, MI	1.04
12	Houston, TX	0.76
13	Kansas City, MO	1.00
14	Los Angeles, CA	1.11
15	Miami, FL	0.80
16	Milwaukee, WI	1.02
17	Minneapolis, MN	0.90
18	New Orleans, LA	0.89

TABLE A.5 (Continued)

19	New York, NY	1.20
20	Philadelphia, PA	1.07
21	Pittsburgh, PA	1.00
22	St. Louis, MO	1.14
23	San Francisco, CA	1.10
24	Seattle, WA	1.06
25	Trenton, NJ	0.98

STATE AND TERRITORIAL MULTIPLIERS

Alaska	2.64
Hawaii	1.53
Puerto Rico	1.43
Virgin Island	1.43
Trust Territories	2.21

TABLE A.6
1982 NEEDS SURVEY
SANITARY SEWER CULTURAL MODIFIERS *

<u>Cultural Definition</u>	<u>Multiplier</u>
Urban	1.13
Suburban	0.95
Rural	0.80

* Use Calvin Beale's Metro/Adjacency Coding System to determine the cultural type.

EXAMPLE IX
COLLECTORS

Determine collector system design and cost for the following Sacramento, CA conditions.

Population Statistics:

	<u>Present Resident</u>	<u>Present Nonresident</u>	<u>Projected Resident</u>	<u>Projected Nonresident</u>
Receiving Treatment	0	0	4,000	0
No Treatment	3,000	0	0	0

Item 25 = 3,000

COST OF RECORD

1. $4,000 - 0 = 4,000$ growth population.
2. $3,000 \times 1.5 = 4,500$ residents.
3. $4,000 < 4,500$; therefore, eligible population is 4,000 residents.
4. From Table A.2, 8" pipe costs \$52/Ft.
5. $4,000 \text{ residents} \times 16 \text{ Ft./Person} \times \$52/\text{Ft.} =$ \$3,328,000
6. From Table A.5 (San Francisco area multiplier) x 1.10
7. Unadjusted Cost Estimate \$3,660,800
8. From Table A.6, Cultural Modifier (Urban) x 1.13
9. Cost Estimate, Report in Category IVA \$4,136,704

BACKLOG*

1. $3,000 \text{ residents} \times 16 \text{ Ft./Person} \times \$52/\text{Ft.} =$ \$2,496,000
2. San Francisco area multiplier x 1.10
3. Unadjusted Cost Estimate \$2,745,600
4. Cultural Modifier x 1.13
5. Cost Estimate, Report in Category IVA \$3,102,528

*Collector Backlog is always determined using Item 25, population.

EXAMPLE X
COLLECTORS

Determine the collector system design and cost for the following town near Pittsburgh, PA.

Population Statistics:

	<u>Present Resident</u>	<u>Present Nonresident</u>	<u>Projected Resident</u>	<u>Projected Nonresident</u>
Receiving Treatment	6,000	200	10,000	300
No Treatment	2,000	0	1,000	0

Item 25 = 1,000

COST OF RECORD

1. $10,000 - 6,000 = 4,000$ growth population.
2. $1,000 \times 1.5 = 1,500$ residents.
3. $1,500 < 4,000$; therefore, eligible population is 1,500 residents.
4. From Table A.2, 8" pipe costs \$52/ft.
5. $1,500 \text{ residents} \times 16 \text{ Ft./Person} \times \$52/\text{Ft.} =$ \$1,248,000
6. From Table A.5 (Pittsburgh area multiplier) x 1.00
7. Unadjusted Cost Estimate \$1,248,000
8. From Table A.6, Cultural Modifier (Urban) x 1.13
9. Cost Estimate, Report in Category IVA \$1,410,240

EXAMPLE XI INTERCEPTORS

Find the required interceptor system design and cost for the following town near Birmingham, AL.

Population Statistics:

	<u>Present Resident</u>	<u>Present Nonresident</u>	<u>Projected Resident</u>	<u>Projected Nonresident</u>
Receiving Treatment	0	0	5,000	0
No Treatment	4,000	0	0	0

COST OF RECORD

1. Total projected population: $5,000 + 0 = 5,000$ residents.
2. From Table A.4, interceptor length = 5,504 Ft.
3. From Table A.3, pipe size = 12" ($5,000 \times 95$ gpcd = 0.48 mgd)
4. From Table A.2, pipe cost = \$64/Ft.
5. 5,504 Ft. x \$64/Ft. = \$352,256
6. From Table A.5 (Birmingham area multiplier) x 0.75
7. Unadjusted Cost Estimate \$264,192
8. From Table A.6, Cultural Modifier (Urban) x 1.13
9. Cost Estimate, Report in Category IVB \$298,537

BACKLOG

1. Total present population: $4,000 + 0 = 4,000$ residents.
2. From Table A.4, interceptor length = 5,080 Ft.
3. From Table A.3, pipe size = 12" ($4,000 \times 95$ gpcd = 0.38 mgd)
4. From Table A.2, pipe cost = \$64/Ft.
5. 5,080 Ft. x \$64/Ft. = \$325,120
6. Birmingham area multiplier x 0.75
7. Unadjusted Cost Estimate \$243,840
8. Cultural Modifier x 1.13
9. Cost Estimate, Report in Category IVB \$275,539

EXAMPLE XII INTERCEPTORS

Find the required interceptor system design and cost for the following town near Los Angeles, CA. Note that the town is partially sewered already.

Population Statistics:

	<u>Present Resident</u>	<u>Present Nonresident</u>	<u>Projected Resident</u>	<u>Projected Nonresident</u>
Receiving Treatment	10,000	1,000	16,000	1,500
No Treatment	4,000	200	3,000	200

COST OF RECORD

1. Total projected population: $16,000 + 3,000 = 19,000$ residents.
2. From Table A.4, unadjusted interceptors length = 8,845 Ft.
3. Growth population: $16,000 - 10,000 = 6,000$ residents.
4. Adjusted interceptors length: $8,845 \times \frac{6,000}{19,000} = 2,830$ Ft.
5. From Table A.3, pipe size = 15"
($6,000 \times 105$ gpcd + 500×60 gpcd = 0.66 mgd)
6. From Table A.2, pipe cost = \$69/Ft.
7. $2,830$ Ft. $\times$ \$69/Ft. =
8. From Table A.5 (Los Angeles area multiplier)
9. Unadjusted Cost Estimate
10. From Table A.6, Cultural Modifier (Urban)
11. Cost Estimate, Report in Category IVB

\$195,270
$\times 1.11$
216,750
$\times 1.13$
244,927

COST ADJUSTMENT FACTORS FOR NON-CODE 7 ESTIMATES

Cost estimates obtained from planning documents must be adjusted to reflect January 1, 1981 dollars before being included in the Needs Survey data base. Tables A.7 and A.8 are to be used to adjust the cost estimates. Estimates to be entered into Categories I, IIA, and IIB will be adjusted using factors found on Table A.7. Estimates to be entered into Categories IIIA, IIIB, IVA, and IVB will be adjusted using factors found on Table A.8. To adjust the cost, select the factor which represents the month and year of the cost estimate presented in the planning document.

Only construction grant eligible project costs are to be entered on the EPA-1 form. All ineligible costs contained in the cost estimate presented in the planning document must be deducted.

TABLE A.7

1982 NEEDS SURVEY

WASTEWATER TREATMENT PLANT
COST ADJUSTMENT FACTORS

	<u>1973</u>	<u>1974</u>	<u>1975</u>	<u>1976</u>	<u>1977</u>	<u>1978</u>	<u>1979</u>	<u>1980</u>	<u>1981</u>
January	----	1.79	1.51	1.52	1.41	1.31	1.15	1.06	0.99
February	----	1.77	1.53	1.50	1.41	1.29	1.14	1.05	0.97
March	----	1.76	1.54	1.49	1.40	1.28	1.13	1.04	0.96
April	----	1.71	1.55	1.48	1.39	1.27	1.12	1.04	0.96
May	----	1.67	1.56	1.47	1.38	1.27	1.12	1.03	0.95
June	----	1.62	1.57	1.46	1.37	1.26	1.11	1.03	0.95
July	----	1.59	1.56	1.45	1.36	1.25	1.10	1.03	0.94
August	----	1.55	1.56	1.44	1.34	1.23	1.10	1.02	0.93
September	1.81	1.52	1.55	1.43	1.33	1.22	1.09	1.02	0.92
October	1.81	1.51	1.54	1.43	1.33	1.20	1.08	1.01	0.92
November	1.80	1.51	1.54	1.42	1.32	1.18	1.08	1.01	0.91
December	1.80	1.50	1.53	1.42	1.32	1.16	1.07	1.00	0.91

TABLE A.8

1982 NEEDS SURVEY

SEWER AND PUMP STATION
COST ADJUSTMENT FACTORS

	<u>1973</u>	<u>1974</u>	<u>1975</u>	<u>1976</u>	<u>1977</u>	<u>1978</u>	<u>1979</u>	<u>1980</u>	<u>1981</u>
January	----	1.81	1.63	1.49	1.38	1.27	1.15	1.05	0.99
February	----	1.81	1.60	1.48	1.37	1.27	1.15	1.04	0.97
March	----	1.80	1.58	1.47	1.36	1.26	1.14	1.03	0.96
April	----	1.77	1.57	1.45	1.35	1.25	1.13	1.03	0.95
May	----	1.74	1.56	1.44	1.35	1.25	1.12	1.02	0.95
June	----	1.71	1.55	1.42	1.34	1.24	1.11	1.02	0.94
July	----	1.71	1.54	1.41	1.33	1.23	1.10	1.02	0.94
August	----	1.71	1.53	1.41	1.31	1.22	1.08	1.01	0.93
September	1.84	1.71	1.52	1.40	1.30	1.21	1.07	1.01	0.93
October	1.83	1.69	1.51	1.40	1.29	1.19	1.07	1.01	0.92
November	1.83	1.67	1.51	1.39	1.29	1.18	1.06	1.00	0.91
December	1.82	1.65	1.50	1.39	1.28	1.16	1.06	1.00	0.90

GENERAL BACKLOG CALCULATION PROCEDURES

For each facility included in the Needs Survey data base, two different cost estimates are prepared. One cost estimate, referred to as the cost of record, is intended to reflect the financial requirements needed to prepare a community for the conditions expected to exist in the year 2000. The other cost estimate, referred to as the backlog cost, is intended to reflect the financial requirements needed to assist a community in providing an adequate level of wastewater treatment for the present population. Cost of record cost estimates are entered in Item 17a of the EPA-1 form and backlog cost estimates are entered in Item 17c.

- o Backlog needs are to be estimated for all need categories except IV-A using the present community population which is defined as the 1980 population reported in the April 1981 report of the Bureau of Census.
- o For category IV-A the 1972 population eligible for collector sewers is to be used to estimate backlog needs.
- o Unless a facility's service area population, quantified in terms of total wastewater flow, is projected to decline from the present to the design year, a backlog need estimate cannot theoretically exceed the corresponding cost of record need estimate.
- o If an existing facility has sufficient hydraulic capacity to serve the present population (treated and untreated; resident and non-resident) and the present design level of treatment is the same as the projected design level of treatment, no backlog needs can be estimated using rule-of-thumb techniques. However, if the State is aware of an extenuating circumstance which would not allow the facility to provide reliable, adequate service for the present population, it is the State's responsibility to provide acceptable documentation of the extenuating circumstance and a method of estimating the need other than and more reliable than rule-of-thumb techniques.
- o If a facility does not have a present population indicated in Item 18 then no backlog needs are allowed. However, there is an exception to this rule. If a facility has been identified and documented as a proposed Regional Treatment Facility and the population to be served by the Regional Facility is currently served by a less than adequate facility then all backlog needs would be recorded with the proposed Regional Facility. Each case must be reviewed on an individual basis with care taken to assign population and needs (including costs of record and backlog needs) to only one facility. In each case, the assessment of backlog will require the concurrent review of two or more facilities.
- o If the projected change to a facility is abandonment, no backlog need will be reported for that facility. Any further needs for the population served by the abandoned facility will be reported with the facility assuming the treatment responsibility for the affected population.

APPENDIX B

SPLIT OF TREATMENT PLANT CONSTRUCTION
COST INTO CATEGORIES I, IIA, AND IIB

1982 NEEDS SURVEY

INTRODUCTION

To facilitate reasonable and simple disaggregation of treatment needs into the proper cost categories (I, IIA and IIB) procedures have been developed based upon the relationships between the 1982 Needs Survey cost curves. These procedures are to be used only when better information is not available.

In order to determine the proper split of construction costs, first select the appropriate change occurring at the treatment plant from the list below and then follow the directions shown to the right. If the split directions indicate the use of a table; go to the table, locate the appropriate flow, and use the ratios given to split up the construction costs. If the directions indicate the use of "change in Q", the flow to be used is the difference between the projected design flow and the present design flow (Item 29-C-1 minus Item 29-B-1). If the exact flow required is not listed, you can interpolate or calculate the ratios using the systems listed at the beginning of each table.

<u>PROJECTED CHANGE</u>	<u>SPLIT DIRECTIONS</u>
NEW CONSTRUCTION	
Secondary	100% Category I
Secondary with N.R.*	Table B.1
AST	Table B.2
AST with N.R.	Table B.3
AWT	Table B.4
AWT with N.R.	Table B.5
ENLARGEMENTS	
Secondary	100% Category I
Secondary with N.R.	Table B.1 with change in Q
AST	Table B.2 with change in Q
AST with N.R.	Table B.3 with change in Q
AWT	Table B.4 with change in Q
AWT with N.R.	Table B.4 with change in Q
UPGRADES	
Primary to Secondary	100% Category I
Primary to Secondary with N.R.	Table B.6
Primary to AST	Table B.7
Primary to AST with N.R.	Table B.8
Primary to AWT	Table B.9
Primary to AWT with N.R.	Table B.10
Secondary to Secondary with N.R.	100% Category IIA
Secondary to AST	100% Category IIA
Secondary to AST with N.R.	100% Category IIA

PROJECTED CHANGE

Secondary to AWT
Secondary to AWT with N.R.
Secondary with N.R. to Secondary with N.R.
Secondary with N.R. to AST with N.R.
Secondary with N.R. to AWT with N.R.
AST to AST
AST to AST with N.R.
AST to AWT
AWT to AWT with N.R.
AST with N.R. to AST with N.R.
AST with N.R. to AWT with N.R.
AWT to AWT with N.R.
AWT with N.R. to AWT with N.R.

ENLARGEMENT AND UPGRADE

Primary to Secondary
Primary to Secondary with N.R.
Primary to AST
Primary to AST with N.R.
Primary to AWT
Primary to AWT with N.R.
Secondary to Secondary with N.R.
Secondary to AST
Secondary to AST with N.R.
Secondary to AWT
Secondary to AWT with N.R.
Secondary with N.R. to Secondary with N.R.
Secondary with N.R. to AST with N.R.
Secondary with N.R. to AWT with N.R.
AST to AST
AST to AST with N.R.
AST to AWT
AST to AWT with N.R.
AST with N.R. to AST with N.R.
AST with N.R. to AWT with N.R.
AWT to AWT with N.R.
AWT with N.R. to AWT with N.R.

SPLIT DIRECTIONS

Table B.11
Table B.12
100% Category IIA
100% Category IIA
100% Category IIB
100% Category IIA
100% Category IIA
100% Category IIB
100% Category IIB
100% Category IIA
100% Category IIB
100% Category IIB
100% Category IIB

100% Category I
Table B.1 with change in Q
Table B.2 with change in Q
Table B.3 with change in Q
Table B.4 with change in Q
Table B.5 with change in Q
Table B.1 with change in Q
Table B.2 with change in Q
Table B.3 with change in Q
Table B.4 with change in Q
Table B.5 with change in Q
Table B.1 with change in Q
Table B.3 with change in Q
Table B.5 with change in Q
Table B.2 with change in Q
Table B.3 with change in Q
Table B.4 with change in Q
Table B.5 with change in Q
Table B.3 with change in Q
Table B.5 with change in Q
Table B.5 with change in Q
Table B.5 with change in Q

* N.R. = Nutrient Removal

EQUATIONS USED TO COMPUTE TABLES B.1 - B.12

<u>CURVE</u>	<u>CONSTANT</u>	<u>EXPONENT</u>
A	691000	1.03
B	1570000	1.11
1	2960000	0.70
1A	3540000	0.70
2	3340000	0.69
2A	4010000	0.68
3	3730000	0.70
3A	4270000	0.87

THE FOLLOWING SUBSTITUTIONS HAVE BEEN MADE FOR COMPUTING VALUES IN TABLES B.1 - B.12. EQUATION 3A IS REPLACED BY EQUATION 2A FOR FLOWS LESS THAN 0.72 MGD. EQUATION B IS REPLACED BY EQUATION 1 FOR FLOWS GREATER THAN 4.69 MGD.

TABLE B.1

SYSTEM FOR CATEGORY I RATIO: 1 - (CAT II-A)
 SYSTEM FOR CATEGORY II-A RATIO: (1A - 1) / 1A

FLOW (MGD)	CATEGORY I RATIO	CATEGORY II-A RATIO
0.01	0.84	0.16
0.02	0.84	0.16
0.03	0.84	0.16
0.04	0.84	0.16
0.05	0.84	0.16
0.06	0.84	0.16
0.07	0.84	0.16
0.08	0.84	0.16
0.09	0.84	0.16
0.10	0.84	0.16
0.15	0.84	0.16
0.20	0.84	0.16
0.25	0.84	0.16
0.30	0.84	0.16
0.35	0.84	0.16
0.40	0.84	0.16
0.45	0.84	0.16
0.50	0.84	0.16
0.55	0.84	0.16
0.60	0.84	0.16
0.65	0.84	0.16
0.70	0.84	0.16
0.75	0.84	0.16
0.80	0.84	0.16
0.85	0.84	0.16
0.90	0.84	0.16
0.95	0.84	0.16

TABLE B.1

FLOW (MGD)	CATEGORY I RATIO	CATEGORY II-A RATIO
1.00	0.84	0.16
1.50	0.84	0.16
2.00	0.84	0.16
2.50	0.84	0.16
3.00	0.84	0.16
3.50	0.84	0.16
4.00	0.84	0.16
4.50	0.84	0.16
5.00	0.84	0.16
5.50	0.84	0.16
6.00	0.84	0.16
6.50	0.84	0.16
7.00	0.84	0.16
7.50	0.84	0.16
8.00	0.84	0.16
8.50	0.84	0.16
9.00	0.84	0.16
9.50	0.84	0.16
10.00	0.84	0.16
10.50	0.84	0.16
11.00	0.84	0.16
11.50	0.84	0.16
12.00	0.84	0.16
12.50	0.84	0.16
13.00	0.84	0.16
13.50	0.84	0.16
14.00	0.84	0.16
14.50	0.84	0.16
15.00	0.84	0.16
15.50	0.84	0.16
16.00	0.84	0.16
16.50	0.84	0.16

TABLE B.1

FLOW (MGD)	CATEGORY I RATIO	CATEGORY II-A RATIO
17.00	0.84	0.16
17.50	0.84	0.16
18.00	0.84	0.16
18.50	0.84	0.16
19.00	0.84	0.16
19.50	0.84	0.16
20.00	0.84	0.16
20.50	0.84	0.16
21.00	0.84	0.16
21.50	0.84	0.16
22.00	0.84	0.16
22.50	0.84	0.16
23.00	0.84	0.16
23.50	0.84	0.16
24.00	0.84	0.16
24.50	0.84	0.16
25.00	0.84	0.16
25.50	0.84	0.16
26.00	0.84	0.16
26.50	0.84	0.16
27.00	0.84	0.16
27.50	0.84	0.16
28.00	0.84	0.16
28.50	0.84	0.16
29.00	0.84	0.16
29.50	0.84	0.16
30.00	0.84	0.16
30.50	0.84	0.16
31.00	0.84	0.16
31.50	0.84	0.16
32.00	0.84	0.16
32.50	0.84	0.16

TABLE B.1

FLOW (MGD)	CATEGORY I RATIO	CATEGORY II-A RATIO
33.00	0.84	0.16
33.50	0.84	0.16
34.00	0.84	0.16
34.50	0.84	0.16
35.00	0.84	0.16
35.50	0.84	0.16
36.00	0.84	0.16
36.50	0.84	0.16
37.00	0.84	0.16
37.50	0.84	0.16
38.00	0.84	0.16
38.50	0.84	0.16
39.00	0.84	0.16
39.50	0.84	0.16
40.00	0.84	0.16
40.50	0.84	0.16
41.00	0.84	0.16
41.50	0.84	0.16
42.00	0.84	0.16
42.50	0.84	0.16
43.00	0.84	0.16
43.50	0.84	0.16
44.00	0.84	0.16
44.50	0.84	0.16
45.00	0.84	0.16
45.50	0.84	0.16
46.00	0.84	0.16
46.50	0.84	0.16
47.00	0.84	0.16
47.50	0.84	0.16
48.00	0.84	0.16
48.50	0.84	0.16

TABLE B.1

FLOW (MGD) -----	CATEGORY I RATIO -----	CATEGORY II-A RATIO -----
49.00	0.84	
49.50	0.84	0.16
50.00	0.84	0.16
		0.16

TABLE 8.2

SYSTEM FOR CATEGORY I RATIO: 1 - (CAT II-A)
 SYSTEM FOR CATEGORY II-A RATIO: (2 - 1) / 2

FLOW (MGD)	CATEGORY I RATIO	CATEGORY II-A RATIO
0.01	0.85	0.15
0.02	0.85	0.15
0.03	0.86	0.14
0.04	0.86	0.14
0.05	0.86	0.14
0.06	0.86	0.14
0.07	0.86	0.14
0.08	0.86	0.14
0.09	0.87	0.13
0.10	0.87	0.13
0.15	0.87	0.13
0.20	0.87	0.13
0.25	0.87	0.13
0.30	0.88	0.12
0.35	0.88	0.12
0.40	0.88	0.12
0.45	0.88	0.12
0.50	0.88	0.12
0.55	0.88	0.12
0.60	0.88	0.12
0.65	0.88	0.12
0.70	0.88	0.12
0.75	0.88	0.12
0.80	0.88	0.12
0.85	0.88	0.12
0.90	0.89	0.11
0.95	0.89	0.11

TABLE B.2

FLOW (MGD)	CATEGORY I RATIO	CATEGORY II-A RATIO
1.00	0.89	0.11
1.50	0.89	0.11
2.00	0.89	0.11
2.50	0.89	0.11
3.00	0.90	0.10
3.50	0.90	0.10
4.00	0.90	0.10
4.50	0.90	0.10
5.00	0.90	0.10
5.50	0.90	0.10
6.00	0.90	0.10
6.50	0.90	0.10
7.00	0.90	0.10
7.50	0.90	0.10
8.00	0.90	0.10
8.50	0.91	0.09
9.00	0.91	0.09
9.50	0.91	0.09
10.00	0.91	0.09
10.50	0.91	0.09
11.00	0.91	0.09
11.50	0.91	0.09
12.00	0.91	0.09
12.50	0.91	0.09
13.00	0.91	0.09
13.50	0.91	0.09
14.00	0.91	0.09
14.50	0.91	0.09
15.00	0.91	0.09
15.50	0.91	0.09
16.00	0.91	0.09
16.50	0.91	0.09

B-10

TABLE B.2

FLOW (MGD)	CATEGORY I RATIO	CATEGORY II-A RATIO
17.00	0.91	0.09
17.50	0.91	0.09
18.00	0.91	0.09
18.50	0.91	0.09
19.00	0.91	0.09
19.50	0.91	0.09
20.00	0.91	0.09
20.50	0.91	0.09
21.00	0.91	0.09
21.50	0.91	0.09
22.00	0.91	0.09
22.50	0.91	0.09
23.00	0.91	0.09
23.50	0.91	0.09
24.00	0.91	0.09
24.50	0.92	0.08
25.00	0.92	0.08
25.50	0.92	0.08
26.00	0.92	0.08
26.50	0.92	0.08
27.00	0.92	0.08
27.50	0.92	0.08
28.00	0.92	0.08
28.50	0.92	0.08
29.00	0.92	0.08
29.50	0.92	0.08
30.00	0.92	0.08
30.50	0.92	0.08
31.00	0.92	0.08
31.50	0.92	0.08
32.00	0.92	0.08
32.50	0.92	0.08

TABLE B.2

FLOW (MGD)	CATEGORY I RATIO	CATEGORY II-A RATIO
33.00	0.92	0.08
33.50	0.92	0.08
34.00	0.92	0.08
34.50	0.92	0.08
35.00	0.92	0.08
35.50	0.92	0.08
36.00	0.92	0.08
36.50	0.92	0.08
37.00	0.92	0.08
37.50	0.92	0.08
38.00	0.92	0.08
38.50	0.92	0.08
39.00	0.92	0.08
39.50	0.92	0.08
40.00	0.92	0.08
40.50	0.92	0.08
41.00	0.92	0.08
41.50	0.92	0.08
42.00	0.92	0.08
42.50	0.92	0.08
43.00	0.92	0.08
43.50	0.92	0.08
44.00	0.92	0.08
44.50	0.92	0.08
45.00	0.92	0.08
45.50	0.92	0.08
46.00	0.92	0.08
46.50	0.92	0.08
47.00	0.92	0.08
47.50	0.92	0.08
48.00	0.92	0.08
48.50	0.92	0.08

TABLE B.2

FLOW (MGD)	CATEGORY I RATIO	CATEGORY II-A RATIO
49.00	0.92	0.08
49.50	0.92	0.08
50.00	0.92	0.08

TABLE B.3

SYSTEM FOR CATEGORY I RATIO: $1 - (\text{CAT II-A})$
 SYSTEM FOR CATEGORY II-A RATIO: $(2A - 1) / 2A$

FLOW (MGD)	CATEGORY I RATIO	CATEGORY II-A RATIO
0.01	0.67	0.33
0.02	0.68	0.32
0.03	0.69	0.31
0.04	0.69	0.31
0.05	0.70	0.30
0.06	0.70	0.30
0.07	0.70	0.30
0.08	0.70	0.30
0.09	0.70	0.30
0.10	0.70	0.30
0.15	0.71	0.29
0.20	0.71	0.29
0.25	0.72	0.28
0.30	0.72	0.28
0.35	0.72	0.28
0.40	0.72	0.28
0.45	0.73	0.27
0.50	0.73	0.27
0.55	0.73	0.27
0.60	0.73	0.27
0.65	0.73	0.27
0.70	0.73	0.27
0.75	0.73	0.27
0.80	0.73	0.27
0.85	0.74	0.26
0.90	0.74	0.26
0.95	0.74	0.26

TABLE B.3

FLOW (MGD)	CATEGORY I RATIO	CATEGORY II-A RATIO
1.00	0.74	0.26
1.50	0.74	0.26
2.00	0.75	0.25
2.50	0.75	0.25
3.00	0.75	0.25
3.50	0.76	0.24
4.00	0.76	0.24
4.50	0.76	0.24
5.00	0.76	0.24
5.50	0.76	0.24
6.00	0.77	0.23
6.50	0.77	0.23
7.00	0.77	0.23
7.50	0.77	0.23
8.00	0.77	0.23
8.50	0.77	0.23
9.00	0.77	0.23
9.50	0.77	0.23
10.00	0.77	0.23
10.50	0.77	0.23
11.00	0.77	0.23
11.50	0.78	0.22
12.00	0.78	0.22
12.50	0.78	0.22
13.00	0.78	0.22
13.50	0.78	0.22
14.00	0.78	0.22
14.50	0.78	0.22
15.00	0.78	0.22
15.50	0.78	0.22
16.00	0.78	0.22
16.50	0.78	0.22

TABLE B.3

FLOW (MGD)	CATEGORY I RATIO	CATEGORY II-A RATIO
17.00	0.78	0.22
17.50	0.78	0.22
18.00	0.78	0.22
18.50	0.78	0.22
19.00	0.78	0.22
19.50	0.78	0.22
20.00	0.78	0.22
20.50	0.78	0.22
21.00	0.78	0.22
21.50	0.78	0.22
22.00	0.79	0.21
22.50	0.79	0.21
23.00	0.79	0.21
23.50	0.79	0.21
24.00	0.79	0.21
24.50	0.79	0.21
25.00	0.79	0.21
25.50	0.79	0.21
26.00	0.79	0.21
26.50	0.79	0.21
27.00	0.79	0.21
27.50	0.79	0.21
28.00	0.79	0.21
28.50	0.79	0.21
29.00	0.79	0.21
29.50	0.79	0.21
30.00	0.79	0.21
30.50	0.79	0.21
31.00	0.79	0.21
31.50	0.79	0.21
32.00	0.79	0.21
32.50	0.79	0.21

TABLE B.3

FLOW (MGD)	CATEGORY I RATIO	CATEGORY II-A RATIO
33.00	0.79	0.21
33.50	0.79	0.21
34.00	0.79	0.21
34.50	0.79	0.21
35.00	0.79	0.21
35.50	0.79	0.21
36.00	0.79	0.21
36.50	0.79	0.21
37.00	0.79	0.21
37.50	0.79	0.21
38.00	0.79	0.21
38.50	0.79	0.21
39.00	0.79	0.21
39.50	0.79	0.21
40.00	0.79	0.21
40.50	0.79	0.21
41.00	0.80	0.20
41.50	0.80	0.20
42.00	0.80	0.20
42.50	0.80	0.20
43.00	0.80	0.20
43.50	0.80	0.20
44.00	0.80	0.20
44.50	0.80	0.20
45.00	0.80	0.20
45.50	0.80	0.20
46.00	0.80	0.20
46.50	0.80	0.20
47.00	0.80	0.20
47.50	0.80	0.20
48.00	0.80	0.20
48.50	0.80	0.20

TABLE B.3

FLOW (MGD) -----	CATEGORY I RATIO -----	CATEGORY II-A RATIO -----
49.00	0.80	0.20
49.50	0.80	0.20
50.00	0.80	0.20

TABLE B.4

SYSTEM FOR CATEGORY I RATIO: $1 - (\text{CAT II-A} + \text{CAT II-B})$
 SYSTEM FOR CATEGORY II-A RATIO: $(2 - 1) / 3$
 SYSTEM FOR CATEGORY II-B RATIO: $(3 - 2) / 3$

FLOW (MGD)	CATEGORY I RATIO	CATEGORY II-A RATIO	CATEGORY II-B RATIO
0.01	0.80	0.14	0.06
0.02	0.79	0.14	0.07
0.03	0.80	0.13	0.07
0.04	0.79	0.13	0.08
0.05	0.79	0.13	0.08
0.06	0.79	0.13	0.08
0.07	0.79	0.13	0.08
0.08	0.80	0.12	0.08
0.09	0.80	0.12	0.08
0.10	0.80	0.12	0.08
0.15	0.79	0.12	0.09
0.20	0.79	0.12	0.09
0.25	0.80	0.11	0.09
0.30	0.80	0.11	0.09
0.35	0.79	0.11	0.10
0.40	0.79	0.11	0.10
0.45	0.79	0.11	0.10
0.50	0.79	0.11	0.10
0.55	0.79	0.11	0.10
0.60	0.79	0.11	0.10
0.65	0.79	0.11	0.10
0.70	0.79	0.11	0.10
0.75	0.80	0.10	0.10
0.80	0.80	0.10	0.10
0.85	0.80	0.10	0.10
0.90	0.80	0.10	0.10
0.95	0.80	0.10	0.10

TABLE B.4

FLOW (MGD)	CATEGORY I RATIO	CATEGORY II-A RATIO	CATEGORY II-B RATIO
1.00	0.80	0.10	0.10
1.50	0.79	0.10	0.11
2.00	0.79	0.10	0.11
2.50	0.80	0.09	0.11
3.00	0.80	0.09	0.11
3.50	0.79	0.09	0.12
4.00	0.79	0.09	0.12
4.50	0.79	0.09	0.12
5.00	0.79	0.09	0.12
5.50	0.79	0.09	0.12
6.00	0.79	0.09	0.12
6.50	0.79	0.09	0.12
7.00	0.80	0.08	0.12
7.50	0.80	0.08	0.12
8.00	0.80	0.08	0.12
8.50	0.80	0.08	0.12
9.00	0.80	0.08	0.12
9.50	0.80	0.08	0.12
10.00	0.80	0.08	0.12
10.50	0.79	0.08	0.13
11.00	0.79	0.08	0.13
11.50	0.79	0.08	0.13
12.00	0.79	0.08	0.13
12.50	0.79	0.08	0.13
13.00	0.79	0.08	0.13
13.50	0.79	0.08	0.13
14.00	0.79	0.08	0.13
14.50	0.79	0.08	0.13
15.00	0.79	0.08	0.13
15.50	0.79	0.08	0.13
16.00	0.79	0.08	0.13
16.50	0.79	0.08	0.13

TABLE B.4

FLOW (MGD)	CATEGORY I RATIO	CATEGORY II-A RATIO	CATEGORY II-B RATIO
17.00	0.79		
17.50	0.79	0.08	0.13
18.00	0.79	0.08	0.13
18.50	0.79	0.08	0.13
19.00	0.79	0.08	0.13
19.50	0.79	0.08	0.13
20.00			
20.50	0.79	0.08	0.13
21.00	0.79	0.08	0.13
21.50	0.80	0.07	0.13
22.00	0.80	0.07	0.13
22.50			
23.00	0.80	0.07	0.13
23.50	0.80	0.07	0.13
24.00	0.80	0.07	0.13
24.50	0.80	0.07	0.13
25.00			
25.50	0.80	0.07	0.13
26.00	0.80	0.07	0.13
26.50	0.80	0.07	0.13
27.00	0.80	0.07	0.13
27.50			
28.00	0.80	0.07	0.13
28.50	0.80	0.07	0.13
29.00	0.80	0.07	0.13
29.50	0.80	0.07	0.13
30.00			
30.50	0.80	0.07	0.13
31.00	0.80	0.07	0.13
31.50	0.80	0.07	0.13
32.00	0.79	0.07	0.13
32.50			
	0.79	0.07	0.14

TABLE B.4

FLOW (MGD)	CATEGORY I RATIO	CATEGORY II-A RATIO	CATEGORY II-B RATIO
33.00	0.79	0.07	0.14
33.50	0.79	0.07	0.14
34.00	0.79	0.07	0.14
34.50	0.79	0.07	0.14
35.00	0.79	0.07	0.14
35.50	0.79	0.07	0.14
36.00	0.79	0.07	0.14
36.50	0.79	0.07	0.14
37.00	0.79	0.07	0.14
37.50	0.79	0.07	0.14
38.00	0.79	0.07	0.14
38.50	0.79	0.07	0.14
39.00	0.79	0.07	0.14
39.50	0.79	0.07	0.14
40.00	0.79	0.07	0.14
40.50	0.79	0.07	0.14
41.00	0.79	0.07	0.14
41.50	0.79	0.07	0.14
42.00	0.79	0.07	0.14
42.50	0.79	0.07	0.14
43.00	0.79	0.07	0.14
43.50	0.79	0.07	0.14
44.00	0.79	0.07	0.14
44.50	0.79	0.07	0.14
45.00	0.79	0.07	0.14
45.50	0.79	0.07	0.14
46.00	0.79	0.07	0.14
46.50	0.79	0.07	0.14
47.00	0.79	0.07	0.14
47.50	0.79	0.07	0.14
48.00	0.79	0.07	0.14
48.50	0.79	0.07	0.14

TABLE B.4

FLOW (MGD)	CATEGORY I RATIO	CATEGORY II-A RATIO	CATEGORY II-B RATIO
49.00	0.79	0.07	0.14
49.50	0.79	0.07	0.14
50.00	0.79	0.07	0.14

TABLE B.5

SYSTEM FOR CATEGORY I RATIO: $1 - (\text{CAT II-A} + \text{CAT II-B})$
 SYSTEM FOR CATEGORY II-A RATIO: $(2 - 1) / 3A$
 SYSTEM FOR CATEGORY II-B RATIO: $(3A - 2) / 3A$

FLOW (MGD)	CATEGORY I RATIO	CATEGORY II-A RATIO	CATEGORY II-B RATIO
0.01	0.68	0.12	0.20
0.02	0.68	0.12	0.20
0.03	0.68	0.12	0.20
0.04	0.70	0.11	0.19
0.05	0.70	0.11	0.19
0.06	0.70	0.11	0.19
0.07	0.70	0.11	0.19
0.08	0.70	0.11	0.19
0.09	0.70	0.11	0.19
0.10	0.70	0.11	0.19
0.15	0.71	0.11	0.18
0.20	0.72	0.10	0.18
0.25	0.72	0.10	0.18
0.30	0.72	0.10	0.18
0.35	0.72	0.10	0.18
0.40	0.73	0.10	0.17
0.45	0.73	0.10	0.17
0.50	0.73	0.10	0.17
0.55	0.73	0.10	0.17
0.60	0.73	0.10	0.17
0.65	0.73	0.10	0.17
0.70	0.73	0.10	0.17
0.75	0.73	0.10	0.17
0.80	0.72	0.09	0.19
0.85	0.72	0.09	0.19
0.90	0.71	0.09	0.20
0.95	0.70	0.09	0.21

TABLE B.5

FLOW (MGD)	CATEGORY I RATIO	CATEGORY II-A RATIO	CATEGORY II-B RATIO
1.00	0.69	0.09	0.22
1.50	0.65	0.08	0.27
2.00	0.62	0.07	0.31
2.50	0.59	0.07	0.34
3.00	0.57	0.07	0.36
3.50	0.56	0.06	0.38
4.00	0.55	0.06	0.39
4.50	0.54	0.06	0.40
5.00	0.53	0.06	0.41
5.50	0.52	0.06	0.42
6.00	0.51	0.06	0.43
6.50	0.51	0.05	0.44
7.00	0.50	0.05	0.45
7.50	0.49	0.05	0.46
8.00	0.49	0.05	0.46
8.50	0.48	0.05	0.47
9.00	0.48	0.05	0.47
9.50	0.47	0.05	0.48
10.00	0.47	0.05	0.48
10.50	0.46	0.05	0.49
11.00	0.46	0.05	0.49
11.50	0.45	0.05	0.50
12.00	0.45	0.05	0.50
12.50	0.45	0.05	0.50
13.00	0.45	0.04	0.51
13.50	0.45	0.04	0.51
14.00	0.45	0.04	0.51
14.50	0.44	0.04	0.52
15.00	0.44	0.04	0.52
15.50	0.44	0.04	0.52
16.00	0.43	0.04	0.53
16.50	0.43	0.04	0.53

TABLE B.5

FLOW (MGD)	CATEGORY I RATIO	CATEGORY II-A RATIO	CATEGORY II-B RATIO
17.00	0.43	0.04	0.53
17.50	0.43	0.04	0.53
18.00	0.42	0.04	0.54
18.50	0.42	0.04	0.54
19.00	0.42	0.04	0.54
19.50	0.42	0.04	0.54
20.00	0.42	0.04	0.54
20.50	0.41	0.04	0.55
21.00	0.41	0.04	0.55
21.50	0.41	0.04	0.55
22.00	0.41	0.04	0.55
22.50	0.41	0.04	0.55
23.00	0.40	0.04	0.56
23.50	0.40	0.04	0.56
24.00	0.40	0.04	0.56
24.50	0.40	0.04	0.56
25.00	0.40	0.04	0.56
25.50	0.40	0.04	0.56
26.00	0.40	0.04	0.56
26.50	0.39	0.04	0.57
27.00	0.39	0.04	0.57
27.50	0.39	0.04	0.57
28.00	0.39	0.04	0.57
28.50	0.39	0.04	0.57
29.00	0.39	0.04	0.57
29.50	0.39	0.04	0.57
30.00	0.38	0.04	0.58
30.50	0.38	0.04	0.58
31.00	0.39	0.03	0.58
31.50	0.39	0.03	0.58
32.00	0.39	0.03	0.58
32.50	0.39	0.03	0.58

TABLE B.5

FLOW (MGD)	CATEGORY I RATIO	CATEGORY II-A RATIO	CATEGORY II-B RATIO
33.00	0.39	0.03	0.58
33.50	0.39	0.03	0.58
34.00	0.38	0.03	0.59
34.50	0.38	0.03	0.59
35.00	0.38	0.03	0.59
35.50	0.38	0.03	0.59
36.00	0.38	0.03	0.59
36.50	0.38	0.03	0.59
37.00	0.38	0.03	0.59
37.50	0.38	0.03	0.59
38.00	0.38	0.03	0.59
38.50	0.38	0.03	0.59
39.00	0.37	0.03	0.60
39.50	0.37	0.03	0.60
40.00	0.37	0.03	0.60
40.50	0.37	0.03	0.60
41.00	0.37	0.03	0.60
41.50	0.37	0.03	0.60
42.00	0.37	0.03	0.60
42.50	0.37	0.03	0.60
43.00	0.37	0.03	0.60
43.50	0.37	0.03	0.60
44.00	0.37	0.03	0.60
44.50	0.37	0.03	0.60
45.00	0.36	0.03	0.61
45.50	0.36	0.03	0.61
46.00	0.36	0.03	0.61
46.50	0.36	0.03	0.61
47.00	0.36	0.03	0.61
47.50	0.36	0.03	0.61
48.00	0.36	0.03	0.61
48.50	0.36	0.03	0.61

TABLE B.5

FLOW (MGD) -----	CATEGORY 1 RATIO -----	CATEGORY II-A RATIO -----	CATEGORY II-B RATIO -----
49.00	0.36	0.03	0.61
49.50	0.36	0.03	0.61
50.00	0.36	0.03	0.61

TABLE B.6

SYSTEM FOR CATEGORY I RATIO: $1 - (\text{CAT II-A})$
 SYSTEM FOR CATEGORY II-A RATIO: $(1A - 1) / (1A - A)$

FLOW (MGD)	CATEGORY I RATIO	CATEGORY II-A RATIO
0.01	0.83	0.17
0.02	0.83	0.17
0.03	0.83	0.17
0.04	0.82	0.18
0.05	0.82	0.18
0.06	0.82	0.18
0.07	0.82	0.18
0.08	0.82	0.18
0.09	0.82	0.18
0.10	0.82	0.18
0.15	0.82	0.18
0.20	0.81	0.19
0.25	0.81	0.19
0.30	0.81	0.19
0.35	0.81	0.19
0.40	0.81	0.19
0.45	0.81	0.19
0.50	0.81	0.19
0.55	0.80	0.20
0.60	0.80	0.20
0.65	0.80	0.20
0.70	0.80	0.20
0.75	0.80	0.20
0.80	0.80	0.20
0.85	0.80	0.20
0.90	0.80	0.20
0.95	0.80	0.20

TABLE B.5

FLOW (MGD)	CATEGORY I RATIO	CATEGORY II-A RATIO
1.00	0.80	0.20
1.50	0.79	0.21
2.00	0.78	0.22
2.50	0.78	0.22
3.00	0.77	0.23
3.50	0.77	0.23
4.00	0.76	0.24
4.50	0.76	0.24
5.00	0.75	0.25
5.50	0.75	0.25
6.00	0.75	0.25
6.50	0.74	0.26
7.00	0.74	0.26
7.50	0.74	0.26
8.00	0.73	0.27
8.50	0.73	0.27
9.00	0.73	0.27
9.50	0.72	0.28
10.00	0.72	0.28
10.50	0.72	0.28
11.00	0.71	0.29
11.50	0.71	0.29
12.00	0.71	0.29
12.50	0.70	0.30
13.00	0.70	0.30
13.50	0.70	0.30
14.00	0.69	0.31
14.50	0.69	0.31
15.00	0.69	0.31
15.50	0.68	0.32
16.00	0.68	0.32
16.50	0.68	0.32

TABLE B.6

FLOW (MGD)	CATEGORY I RATIO	CATEGORY II-A RATIO
17.00	0.67	0.33
17.50	0.67	0.33
18.00	0.67	0.33
18.50	0.66	0.34
19.00	0.66	0.34
19.50	0.66	0.34
20.00	0.66	0.34
20.50	0.65	0.35
21.00	0.65	0.35
21.50	0.65	0.35
22.00	0.64	0.36
22.50	0.64	0.36
23.00	0.64	0.36
23.50	0.63	0.37
24.00	0.63	0.37
24.50	0.63	0.37
25.00	0.62	0.38
25.50	0.62	0.38
26.00	0.62	0.38
26.50	0.61	0.39
27.00	0.61	0.39
27.50	0.61	0.39
28.00	0.60	0.40
28.50	0.60	0.40
29.00	0.60	0.40
29.50	0.59	0.41
30.00	0.59	0.41
30.50	0.59	0.41
31.00	0.58	0.42
31.50	0.58	0.42
32.00	0.58	0.42
32.50	0.57	0.43

TABLE B.6

FLOW (MGD)	CATEGORY I RATIO	CATEGORY II-A RATIO
-----	-----	-----
33.00	0.57	0.43
33.50	0.57	0.43
34.00	0.56	0.44
34.50	0.56	0.44
35.00	0.56	0.44
35.50	0.55	0.45
36.00	0.55	0.45
36.50	0.55	0.45
37.00	0.54	0.46
37.50	0.54	0.46
38.00	0.53	0.47
38.50	0.53	0.47
39.00	0.53	0.47
39.50	0.52	0.48
40.00	0.52	0.48
40.50	0.52	0.48
41.00	0.51	0.49
41.50	0.51	0.49
42.00	0.50	0.50
42.50	0.50	0.50
43.00	0.50	0.50
43.50	0.49	0.51
44.00	0.49	0.51
44.50	0.48	0.52
45.00	0.48	0.52
45.50	0.47	0.53
46.00	0.47	0.53
46.50	0.47	0.53
47.00	0.46	0.54
47.50	0.46	0.54
48.00	0.45	0.55
48.50	0.45	0.55

TABLE B.6

FLOW (MGD)	CATEGORY I RATIO	CATEGORY II-A RATIO
49.00	0.44	0.56
49.50	0.44	0.56
50.00	0.44	0.56

TABLE B.7

SYSTEM FOR CATEGORY I RATIO: $1 - (\text{CAT II-A})$
 SYSTEM FOR CATEGORY II-A RATIO: $(2 - 1) / (2 - A)$

FLOW (MGD)	CATEGORY I RATIO	CATEGORY II-A RATIO
0.01	0.84	0.16
0.02	0.84	0.16
0.03	0.85	0.15
0.04	0.85	0.15
0.05	0.85	0.15
0.06	0.85	0.15
0.07	0.85	0.15
0.08	0.85	0.15
0.09	0.85	0.15
0.10	0.85	0.15
0.15	0.85	0.15
0.20	0.85	0.15
0.25	0.86	0.14
0.30	0.86	0.14
0.35	0.86	0.14
0.40	0.86	0.14
0.45	0.86	0.14
0.50	0.86	0.14
0.55	0.86	0.14
0.60	0.86	0.14
0.65	0.86	0.14
0.70	0.86	0.14
0.75	0.86	0.14
0.80	0.86	0.14
0.85	0.86	0.14
0.90	0.86	0.14
0.95	0.86	0.14

TABLE 8.7

FLOW (MGD)	CATEGORY I RATIO	CATEGORY II-A RATIO
1.00	0.86	0.14
1.50	0.86	0.14
2.00	0.85	0.15
2.50	0.85	0.15
3.00	0.85	0.15
3.50	0.85	0.15
4.00	0.85	0.15
4.50	0.85	0.15
5.00	0.85	0.15
5.50	0.84	0.16
6.00	0.84	0.16
6.50	0.84	0.16
7.00	0.84	0.16
7.50	0.84	0.16
8.00	0.84	0.16
8.50	0.83	0.17
9.00	0.83	0.17
9.50	0.83	0.17
10.00	0.83	0.17
10.50	0.83	0.17
11.00	0.83	0.17
11.50	0.83	0.17
12.00	0.82	0.18
12.50	0.82	0.18
13.00	0.82	0.18
13.50	0.82	0.18
14.00	0.82	0.18
14.50	0.82	0.18
15.00	0.81	0.19
15.50	0.81	0.19
16.00	0.81	0.19
16.50	0.81	0.19

TABLE B.7

FLOW (MGD)	CATEGORY I RATIO	CATEGORY II-A RATIO
17.00	0.81	0.19
17.50	0.81	0.19
18.00	0.80	0.20
18.50	0.80	0.20
19.00	0.80	0.20
19.50	0.80	0.20
20.00	0.80	0.20
20.50	0.79	0.21
21.00	0.79	0.21
21.50	0.79	0.21
22.00	0.79	0.21
22.50	0.79	0.21
23.00	0.79	0.21
23.50	0.78	0.22
24.00	0.78	0.22
24.50	0.78	0.22
25.00	0.78	0.22
25.50	0.78	0.22
26.00	0.77	0.23
26.50	0.77	0.23
27.00	0.77	0.23
27.50	0.77	0.23
28.00	0.77	0.23
28.50	0.76	0.24
29.00	0.76	0.24
29.50	0.76	0.24
30.00	0.76	0.24
30.50	0.76	0.24
31.00	0.75	0.25
31.50	0.75	0.25
32.00	0.75	0.25
32.50	0.75	0.25

TABLE B.7

FLOW (MGD)	CATEGORY I RATIO	CATEGORY II-A RATIO
33.00	0.74	0.26
33.50	0.74	0.26
34.00	0.74	0.26
34.50	0.74	0.26
35.00	0.73	0.27
35.50	0.73	0.27
36.00	0.73	0.27
36.50	0.73	0.27
37.00	0.72	0.28
37.50	0.72	0.28
38.00	0.72	0.28
38.50	0.72	0.28
39.00	0.71	0.29
39.50	0.71	0.29
40.00	0.71	0.29
40.50	0.70	0.30
41.00	0.70	0.30
41.50	0.70	0.30
42.00	0.70	0.30
42.50	0.69	0.31
43.00	0.69	0.31
43.50	0.69	0.31
44.00	0.68	0.32
44.50	0.68	0.32
45.00	0.68	0.32
45.50	0.67	0.33
46.00	0.67	0.33
46.50	0.67	0.33
47.00	0.66	0.34
47.50	0.66	0.34
48.00	0.66	0.34
48.50	0.65	0.35

B-37

TABLE B.7

FLOW (MGD)	CATEGORY I RATIO	CATEGORY II-A RATIO
49.00	0.65	0.35
49.50	0.64	0.36
50.00	0.64	0.36

TABLE B.8

SYSTEM FOR CATEGORY I RATIO: 1 - (CAT II-A)
 SYSTEM FOR CATEGORY II-A RATIO: (2A - 1) / (2A - A)

FLOW (MGD)	CATEGORY I RATIO	CATEGORY II-A RATIO
0.01	0.66	0.34
0.02	0.67	0.33
0.03	0.67	0.33
0.04	0.67	0.33
0.05	0.68	0.32
0.06	0.68	0.32
0.07	0.68	0.32
0.08	0.68	0.32
0.09	0.68	0.32
0.10	0.68	0.32
0.15	0.68	0.32
0.20	0.68	0.32
0.25	0.68	0.32
0.30	0.68	0.32
0.35	0.69	0.31
0.40	0.69	0.31
0.45	0.69	0.31
0.50	0.69	0.31
0.55	0.69	0.31
0.60	0.69	0.31
0.65	0.69	0.31
0.70	0.68	0.32
0.75	0.68	0.32
0.80	0.68	0.32
0.85	0.68	0.32
0.90	0.68	0.32
0.95	0.68	0.32

TABLE B.8

FLOW (MGD)	CATEGORY I RATIO	CATEGORY II-A RATIO
1.00	0.68	0.32
1.50	0.68	0.32
2.00	0.68	0.32
2.50	0.67	0.33
3.00	0.67	0.33
3.50	0.67	0.33
4.00	0.67	0.33
4.50	0.66	0.34
5.00	0.66	0.34
5.50	0.66	0.34
6.00	0.65	0.35
6.50	0.65	0.35
7.00	0.65	0.35
7.50	0.64	0.36
8.00	0.64	0.36
8.50	0.64	0.36
9.00	0.64	0.36
9.50	0.63	0.37
10.00	0.63	0.37
10.50	0.63	0.37
11.00	0.62	0.38
11.50	0.62	0.38
12.00	0.62	0.38
12.50	0.62	0.38
13.00	0.61	0.39
13.50	0.61	0.39
14.00	0.61	0.39
14.50	0.61	0.39
15.00	0.60	0.40
15.50	0.60	0.40
16.00	0.60	0.40
16.50	0.59	0.41

TABLE B.8

FLOW (MGD)	CATEGORY I RATIO	CATEGORY II-A RATIO
17.00	0.59	0.41
17.50	0.59	0.41
18.00	0.59	0.41
18.50	0.58	0.42
19.00	0.58	0.42
19.50	0.58	0.42
20.00	0.57	0.43
20.50	0.57	0.43
21.00	0.57	0.43
21.50	0.57	0.43
22.00	0.56	0.44
22.50	0.56	0.44
23.00	0.56	0.44
23.50	0.55	0.45
24.00	0.55	0.45
24.50	0.55	0.45
25.00	0.55	0.45
25.50	0.54	0.46
26.00	0.54	0.46
26.50	0.54	0.46
27.00	0.53	0.47
27.50	0.53	0.47
28.00	0.53	0.47
28.50	0.52	0.48
29.00	0.52	0.48
29.50	0.52	0.48
30.00	0.52	0.48
30.50	0.51	0.49
31.00	0.51	0.49
31.50	0.51	0.49
32.00	0.50	0.50
32.50	0.50	0.50

TABLE B.8

FLOW (MGD)	CATEGORY I RATIO	CATEGORY II-A RATIO
33.00	0.50	0.50
33.50	0.49	0.51
34.00	0.49	0.51
34.50	0.49	0.51
35.00	0.48	0.52
35.50	0.48	0.52
36.00	0.48	0.52
36.50	0.47	0.53
37.00	0.47	0.53
37.50	0.47	0.53
38.00	0.46	0.54
38.50	0.46	0.54
39.00	0.46	0.54
39.50	0.45	0.55
40.00	0.45	0.55
40.50	0.45	0.55
41.00	0.44	0.56
41.50	0.44	0.56
42.00	0.44	0.56
42.50	0.43	0.57
43.00	0.43	0.57
43.50	0.42	0.58
44.00	0.42	0.58
44.50	0.42	0.58
45.00	0.41	0.59
45.50	0.41	0.59
46.00	0.41	0.59
46.50	0.40	0.60
47.00	0.40	0.60
47.50	0.39	0.61
48.00	0.39	0.61
48.50	0.39	0.61

TABLE B.8

FLOW (MGD)	CATEGORY I RATIO	CATEGORY II-A RATIO
49.00	0.38	0.62
49.50	0.38	0.62
50.00	0.37	0.63

TABLE B.9

SYSTEM FOR CATEGORY I RATIO: $1 - (\text{CAT II-A} + \text{CAT II-B})$
 SYSTEM FOR CATEGORY II-A RATIO: $(2 - 1) / (3 - A)$
 SYSTEM FOR CATEGORY II-B RATIO: $(3 - 2) / (3 - A)$

FLOW (MGD)	CATEGORY I RATIO	CATEGORY II-A RATIO	CATEGORY II-B RATIO
0.01	0.79	0.15	0.06
0.02	0.79	0.14	0.07
0.03	0.78	0.14	0.08
0.04	0.78	0.14	0.08
0.05	0.78	0.14	0.08
0.06	0.77	0.14	0.09
0.07	0.77	0.14	0.09
0.08	0.77	0.14	0.09
0.09	0.78	0.13	0.09
0.10	0.78	0.13	0.09
0.15	0.77	0.13	0.10
0.20	0.77	0.13	0.10
0.25	0.77	0.13	0.10
0.30	0.76	0.13	0.11
0.35	0.76	0.13	0.11
0.40	0.76	0.13	0.11
0.45	0.76	0.13	0.11
0.50	0.75	0.13	0.12
0.55	0.75	0.13	0.12
0.60	0.75	0.13	0.12
0.65	0.75	0.13	0.12
0.70	0.75	0.13	0.12
0.75	0.75	0.13	0.12
0.80	0.75	0.13	0.12
0.85	0.74	0.13	0.13
0.90	0.74	0.13	0.13
0.95	0.74	0.13	0.13

TABLE B.9

FLOW (MG/L)	CATEGORY I RATIO	CATEGORY II-A RATIO	CATEGORY II-B RATIO
1.00	0.74	0.13	0.13
1.50	0.74	0.12	0.14
2.00	0.74	0.12	0.14
2.50	0.72	0.13	0.15
3.00	0.71	0.13	0.16
3.50	0.71	0.13	0.16
4.00	0.70	0.13	0.17
4.50	0.70	0.13	0.17
5.00	0.70	0.13	0.17
5.50	0.69	0.13	0.18
6.00	0.69	0.13	0.18
6.50	0.69	0.13	0.18
7.00	0.68	0.13	0.19
7.50	0.68	0.13	0.19
8.00	0.68	0.13	0.19
8.50	0.67	0.13	0.20
9.00	0.67	0.13	0.20
9.50	0.67	0.13	0.20
10.00	0.66	0.13	0.21
10.50	0.65	0.14	0.21
11.00	0.65	0.14	0.21
11.50	0.64	0.14	0.22
12.00	0.64	0.14	0.22
12.50	0.64	0.14	0.22
13.00	0.64	0.14	0.22
13.50	0.63	0.14	0.23
14.00	0.63	0.14	0.23
14.50	0.63	0.14	0.23
15.00	0.63	0.14	0.23
15.50	0.62	0.14	0.24
16.00	0.62	0.14	0.24
16.50	0.62	0.14	0.24

TABLE B.9

FLOW (MGD)	CATEGORY I RATIO	CATEGORY II-A RATIO	CATEGORY II-B RATIO
17.00	0.60	0.15	0.25
17.50	0.60	0.15	0.25
18.00	0.60	0.15	0.25
18.50	0.60	0.15	0.25
19.00	0.59	0.15	0.26
19.50	0.59	0.15	0.26
20.00	0.59	0.15	0.26
20.50	0.59	0.15	0.26
21.00	0.58	0.15	0.27
21.50	0.58	0.15	0.27
22.00	0.58	0.15	0.27
22.50	0.58	0.15	0.27
23.00	0.56	0.16	0.28
23.50	0.56	0.16	0.28
24.00	0.56	0.16	0.28
24.50	0.56	0.16	0.28
25.00	0.55	0.16	0.29
25.50	0.55	0.16	0.29
26.00	0.55	0.16	0.29
26.50	0.55	0.16	0.29
27.00	0.54	0.16	0.30
27.50	0.54	0.16	0.30
28.00	0.54	0.16	0.30
28.50	0.54	0.16	0.30
29.00	0.52	0.17	0.31
29.50	0.52	0.17	0.31
30.00	0.52	0.17	0.31
30.50	0.52	0.17	0.31
31.00	0.51	0.17	0.32
31.50	0.51	0.17	0.32
32.00	0.51	0.17	0.32
32.50	0.50	0.17	0.33

TABLE B.9

FLOW (MGD)	CATEGORY I RATIO	CATEGORY II-A RATIO	CATEGORY II-B RATIO
33.00	0.50	0.17	0.33
33.50	0.50	0.17	0.33
34.00	0.50	0.17	0.33
34.50	0.48	0.18	0.34
35.00	0.48	0.18	0.34
35.50	0.48	0.18	0.34
36.00	0.48	0.18	0.34
36.50	0.47	0.18	0.35
37.00	0.47	0.18	0.35
37.50	0.47	0.18	0.35
38.00	0.47	0.18	0.35
38.50	0.46	0.18	0.36
39.00	0.46	0.18	0.36
39.50	0.46	0.18	0.36
40.00	0.44	0.19	0.37
40.50	0.44	0.19	0.37
41.00	0.44	0.19	0.37
41.50	0.44	0.19	0.37
42.00	0.43	0.19	0.38
42.50	0.43	0.19	0.38
43.00	0.43	0.19	0.38
43.50	0.42	0.19	0.39
44.00	0.42	0.19	0.39
44.50	0.42	0.19	0.39
45.00	0.41	0.20	0.39
45.50	0.40	0.20	0.40
46.00	0.40	0.20	0.40
46.50	0.40	0.20	0.40
47.00	0.39	0.20	0.41
47.50	0.39	0.20	0.41
48.00	0.39	0.20	0.41
48.50	0.38	0.20	0.42

TABLE B.9

FLOW (MGD)	CATEGORY I RATIO	CATEGORY II-A RATIO	CATEGORY II-B RATIO
49.00	0.38	0.20	0.42
49.50	0.37	0.21	0.42
50.00	0.36	0.21	0.43

TABLE B.10

SYSTEM FOR CATEGORY I RATIO: $1 - (\text{CAT II-A} + \text{CAT II-B})$
 SYSTEM FOR CATEGORY II-A RATIO: $(2 - 1) / (3A - A)$
 SYSTEM FOR CATEGORY II-B RATIO: $(3A - 2) / (3A - A)$

FLOW (MGD)	CATEGORY I RATIO	CATEGORY II-A RATIO	CATEGORY II-B RATIO
0.01	0.66	0.13	0.21
0.02	0.67	0.12	0.21
0.03	0.67	0.12	0.21
0.04	0.68	0.12	0.20
0.05	0.68	0.12	0.20
0.06	0.68	0.12	0.20
0.07	0.68	0.12	0.20
0.08	0.68	0.12	0.20
0.09	0.68	0.12	0.20
0.10	0.68	0.12	0.20
0.15	0.68	0.12	0.20
0.20	0.68	0.12	0.20
0.25	0.68	0.12	0.20
0.30	0.68	0.12	0.20
0.35	0.68	0.12	0.20
0.40	0.69	0.11	0.20
0.45	0.69	0.11	0.20
0.50	0.69	0.11	0.20
0.55	0.69	0.11	0.20
0.60	0.69	0.11	0.20
0.65	0.69	0.11	0.20
0.70	0.69	0.11	0.20
0.75	0.69	0.11	0.20
0.80	0.67	0.11	0.22
0.85	0.66	0.11	0.23
0.90	0.65	0.11	0.24
0.95	0.64	0.11	0.25

TABLE B.10

FLOW (MGD)	CATEGORY I RATIO	CATEGORY II-A RATIO	CATEGORY II-B RATIO
1.00	0.63	0.11	0.26
1.50	0.57	0.10	0.33
2.00	0.53	0.09	0.38
2.50	0.50	0.09	0.41
3.00	0.48	0.08	0.44
3.50	0.45	0.08	0.47
4.00	0.43	0.08	0.49
4.50	0.41	0.08	0.51
5.00	0.41	0.07	0.52
5.50	0.39	0.07	0.54
6.00	0.38	0.07	0.55
6.50	0.37	0.07	0.56
7.00	0.35	0.07	0.58
7.50	0.34	0.07	0.59
8.00	0.33	0.07	0.60
8.50	0.32	0.07	0.61
9.00	0.33	0.06	0.61
9.50	0.32	0.06	0.62
10.00	0.31	0.06	0.63
10.50	0.30	0.06	0.64
11.00	0.29	0.06	0.65
11.50	0.29	0.06	0.65
12.00	0.28	0.06	0.66
12.50	0.28	0.06	0.66
13.00	0.27	0.06	0.67
13.50	0.26	0.06	0.68
14.00	0.26	0.06	0.68
14.50	0.25	0.06	0.69
15.00	0.25	0.06	0.69
15.50	0.24	0.06	0.70
16.00	0.24	0.06	0.70
16.50	0.23	0.06	0.71

TABLE B.10

FLOW (MGD)	CATEGORY I RATIO	CATEGORY II-A RATIO	CATEGORY II-B RATIO
17.00	0.23	0.06	0.71
17.50	0.22	0.06	0.72
18.00	0.23	0.05	0.72
18.50	0.23	0.05	0.72
19.00	0.22	0.05	0.73
19.50	0.22	0.05	0.73
20.00	0.21	0.05	0.74
20.50	0.21	0.05	0.74
21.00	0.21	0.05	0.74
21.50	0.20	0.05	0.75
22.00	0.20	0.05	0.75
22.50	0.20	0.05	0.75
23.00	0.19	0.05	0.76
23.50	0.19	0.05	0.76
24.00	0.19	0.05	0.76
24.50	0.18	0.05	0.77
25.00	0.18	0.05	0.77
25.50	0.18	0.05	0.77
26.00	0.17	0.05	0.78
26.50	0.17	0.05	0.78
27.00	0.17	0.05	0.78
27.50	0.16	0.05	0.79
28.00	0.16	0.05	0.79
28.50	0.16	0.05	0.79
29.00	0.16	0.05	0.79
29.50	0.15	0.05	0.80
30.00	0.15	0.05	0.80
30.50	0.15	0.05	0.80
31.00	0.15	0.05	0.80
31.50	0.14	0.05	0.81
32.00	0.14	0.05	0.81
32.50	0.14	0.05	0.81

TABLE B.10

FLOW (MGD)	CATEGORY I RATIO	CATEGORY II-A RATIO	CATEGORY II-B RATIO
33.00	0.14	0.05	0.81
33.50	0.13	0.05	0.82
34.00	0.13	0.05	0.82
34.50	0.13	0.05	0.82
35.00	0.13	0.05	0.82
35.50	0.13	0.05	0.82
36.00	0.12	0.05	0.83
36.50	0.12	0.05	0.83
37.00	0.12	0.05	0.83
37.50	0.12	0.05	0.83
38.00	0.11	0.05	0.84
38.50	0.11	0.05	0.84
39.00	0.11	0.05	0.84
39.50	0.11	0.05	0.84
40.00	0.11	0.05	0.84
40.50	0.10	0.05	0.85
41.00	0.10	0.05	0.85
41.50	0.10	0.05	0.85
42.00	0.10	0.05	0.85
42.50	0.10	0.05	0.85
43.00	0.09	0.05	0.86
43.50	0.10	0.04	0.86
44.00	0.10	0.04	0.86
44.50	0.10	0.04	0.86
45.00	0.10	0.04	0.86
45.50	0.10	0.04	0.86
46.00	0.09	0.04	0.87
46.50	0.09	0.04	0.87
47.00	0.09	0.04	0.87
47.50	0.09	0.04	0.87
48.00	0.09	0.04	0.87
48.50	0.09	0.04	0.87

TABLE B.10

FLOW (MGD)	CATEGORY I RATIO	CATEGORY II-A RATIO	CATEGORY II-B RATIO
49.00	0.08	0.04	0.88
49.50	0.08	0.04	0.88
50.00	0.08	0.04	0.88

TABLE 8.11

SYSTEM FOR CATEGORY II-A RATIO: $1 - (\text{CAT II-B})$
 SYSTEM FOR CATEGORY II-B RATIO: $(3 - 2) / (3 - 8)$

FLOW (MGD)	CATEGORY II-A RATIO	CATEGORY II-B RATIO
0.01	0.93	0.07
0.02	0.92	0.08
0.03	0.92	0.08
0.04	0.92	0.08
0.05	0.91	0.09
0.06	0.91	0.09
0.07	0.91	0.09
0.08	0.90	0.10
0.09	0.90	0.10
0.10	0.90	0.10
0.15	0.89	0.11
0.20	0.88	0.12
0.25	0.88	0.12
0.30	0.87	0.13
0.35	0.87	0.13
0.40	0.86	0.14
0.45	0.86	0.14
0.50	0.86	0.14
0.55	0.85	0.15
0.60	0.85	0.15
0.65	0.84	0.16
0.70	0.84	0.16
0.75	0.84	0.16
0.80	0.83	0.17
0.85	0.83	0.17
0.90	0.83	0.17
0.95	0.82	0.18

TABLE B.11

FLOW (MGD)	CATEGORY II-A RATIO	CATEGORY II-B RATIO
-----	-----	-----
1.00	0.82	0.18
1.50	0.78	0.22
2.00	0.75	0.25
2.50	0.71	0.29
3.00	0.66	0.34
3.50	0.61	0.39
4.00	0.55	0.45
4.50	0.46	0.54
5.00	0.36	0.64
5.50	0.42	0.58
6.00	0.42	0.58
6.50	0.41	0.59
7.00	0.41	0.59
7.50	0.41	0.59
8.00	0.40	0.60
8.50	0.40	0.60
9.00	0.40	0.60
9.50	0.40	0.60
10.00	0.39	0.61
10.50	0.39	0.61
11.00	0.39	0.61
11.50	0.39	0.61
12.00	0.39	0.61
12.50	0.39	0.61
13.00	0.38	0.62
13.50	0.38	0.62
14.00	0.38	0.62
14.50	0.38	0.62
15.00	0.38	0.62
15.50	0.38	0.62
16.00	0.37	0.63
16.50	0.37	0.63

TABLE B.11

FLOW (MGD)	CATEGORY II-A RATIO	CATEGORY II-B RATIO
17.00	0.37	0.63
17.50	0.37	0.63
18.00	0.37	0.63
18.50	0.37	0.63
19.00	0.37	0.63
19.50	0.37	0.63
20.00	0.37	0.63
20.50	0.36	0.64
21.00	0.36	0.64
21.50	0.36	0.64
22.00	0.36	0.64
22.50	0.36	0.64
23.00	0.36	0.64
23.50	0.36	0.64
24.00	0.36	0.64
24.50	0.36	0.64
25.00	0.36	0.64
25.50	0.36	0.64
26.00	0.35	0.65
26.50	0.35	0.65
27.00	0.35	0.65
27.50	0.35	0.65
28.00	0.35	0.65
28.50	0.35	0.65
29.00	0.35	0.65
29.50	0.35	0.65
30.00	0.35	0.65
30.50	0.35	0.65
31.00	0.35	0.65
31.50	0.35	0.65
32.00	0.35	0.65
32.50	0.35	0.65

TABLE B.11

FLOW (MGD)	CATEGORY II-A RATIO	CATEGORY II-B RATIO
33.00	0.34	0.66
33.50	0.34	0.66
34.00	0.34	0.66
34.50	0.34	0.66
35.00	0.34	0.66
35.50	0.34	0.66
36.00	0.34	0.66
36.50	0.34	0.66
37.00	0.34	0.66
37.50	0.34	0.66
38.00	0.34	0.66
38.50	0.34	0.66
39.00	0.34	0.66
39.50	0.34	0.66
40.00	0.34	0.66
40.50	0.34	0.66
41.00	0.34	0.66
41.50	0.33	0.67
42.00	0.33	0.67
42.50	0.33	0.67
43.00	0.33	0.67
43.50	0.33	0.67
44.00	0.33	0.67
44.50	0.33	0.67
45.00	0.33	0.67
45.50	0.33	0.67
46.00	0.33	0.67
46.50	0.33	0.67
47.00	0.33	0.67
47.50	0.33	0.67
48.00	0.33	0.67
48.50	0.33	0.67

TABLE B.11

FLOW (MGD)	CATEGORY II-A RATIO	CATEGORY II-B RATIO
49.00	0.33	0.67
49.50	0.33	0.67
50.00	0.33	0.67

TABLE B.12

SYSTEM FOR CATEGORY II-A RATIO: $1 - (\text{CAT II-B})$
 SYSTEM FOR CATEGORY II-B RATIO: $(3A - 2) / (3A - 8)$

FLOW (MGD)	CATEGORY II-A RATIO	CATEGORY II-B RATIO
0.01	0.78	0.22
0.02	0.79	0.21
0.03	0.79	0.21
0.04	0.79	0.21
0.05	0.79	0.21
0.06	0.78	0.22
0.07	0.78	0.22
0.08	0.78	0.22
0.09	0.78	0.22
0.10	0.78	0.22
0.15	0.78	0.22
0.20	0.78	0.22
0.25	0.77	0.23
0.30	0.77	0.23
0.35	0.77	0.23
0.40	0.76	0.24
0.45	0.76	0.24
0.50	0.76	0.24
0.55	0.75	0.25
0.60	0.75	0.25
0.65	0.75	0.25
0.70	0.74	0.26
0.75	0.74	0.26
0.80	0.71	0.29
0.85	0.70	0.30
0.90	0.68	0.32
0.95	0.67	0.33

TABLE B.12

FLOW (MGD)	CATEGORY II-A RATIO	CATEGORY II-B RATIO
1.00	0.66	0.34
1.50	0.54	0.46
2.00	0.45	0.55
2.50	0.38	0.62
3.00	0.31	0.69
3.50	0.25	0.75
4.00	0.20	0.80
4.50	0.15	0.85
5.00	0.10	0.90
5.50	0.12	0.88
6.00	0.11	0.89
6.50	0.11	0.89
7.00	0.11	0.89
7.50	0.10	0.90
8.00	0.10	0.90
8.50	0.10	0.90
9.00	0.09	0.91
9.50	0.09	0.91
10.00	0.09	0.91
10.50	0.09	0.91
11.00	0.09	0.91
11.50	0.09	0.91
12.00	0.08	0.92
12.50	0.08	0.92
13.00	0.08	0.92
13.50	0.08	0.92
14.00	0.08	0.92
14.50	0.08	0.92
15.00	0.08	0.92
15.50	0.08	0.92
16.00	0.07	0.93
16.50	0.07	0.93

TABLE B.12

FLOW (MGD)	CATEGORY II-A RATIO	CATEGORY II-B RATIO
17.00	0.07	0.93
17.50	0.07	0.93
18.00	0.07	0.93
18.50	0.07	0.93
19.00	0.07	0.93
19.50	0.07	0.93
20.00	0.07	0.93
20.50	0.07	0.93
21.00	0.07	0.93
21.50	0.07	0.93
22.00	0.07	0.93
22.50	0.06	0.94
23.00	0.06	0.94
23.50	0.06	0.94
24.00	0.06	0.94
24.50	0.06	0.94
25.00	0.06	0.94
25.50	0.06	0.94
26.00	0.06	0.94
26.50	0.06	0.94
27.00	0.06	0.94
27.50	0.06	0.94
28.00	0.06	0.94
28.50	0.06	0.94
29.00	0.06	0.94
29.50	0.06	0.94
30.00	0.06	0.94
30.50	0.06	0.94
31.00	0.06	0.94
31.50	0.06	0.94
32.00	0.06	0.94
32.50	0.06	0.94

TABLE B.12

FLOW (MGD)	CATEGORY II-A RATIO	CATEGORY II-B RATIO
-----	-----	-----
33.00	0.06	0.94
33.50	0.06	0.94
34.00	0.05	0.95
34.50	0.05	0.95
35.00	0.05	0.95
35.50	0.05	0.95
36.00	0.05	0.95
36.50	0.05	0.95
37.00	0.05	0.95
37.50	0.05	0.95
38.00	0.05	0.95
38.50	0.05	0.95
39.00	0.05	0.95
39.50	0.05	0.95
40.00	0.05	0.95
40.50	0.05	0.95
41.00	0.05	0.95
41.50	0.05	0.95
42.00	0.05	0.95
42.50	0.05	0.95
43.00	0.05	0.95
43.50	0.05	0.95
44.00	0.05	0.95
44.50	0.05	0.95
45.00	0.05	0.95
45.50	0.05	0.95
46.00	0.05	0.95
46.50	0.05	0.95
47.00	0.05	0.95
47.50	0.05	0.95
48.00	0.05	0.95
48.50	0.05	0.95

TABLE B.12

FLOW (MGD)	CATEGORY II-A RATIO	CATEGORY II-B RATIO
49.00	0.05	0.95
49.50	0.05	0.95
50.00	0.05	0.95

APPENDIX C

DEFINITIONS FOR ITEM 32a
"TREATMENT AND SLUDGE HANDLING"
FOR THE 1982 NEEDS SURVEY

This document was prepared under the direction of the U.S. Environmental Protection Agency, Office of Water Program Operations, Facility Requirements Division, and the 1982 Needs Survey contractor, URS Corporation, by:

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PREFACE

This document was prepared to assist in the completion of the inventory of facilities for the 1982 Needs Survey. It is intended to be used for the completion of Item 32a, "Treatment and Sludge Handling," on the EPA-1 form. The primary purpose of this reference is to promote uniformity nationwide for the definitions of unit processes and unit operations. Copies have been distributed to all parties participating in the Survey - contractor staff, State staffs, EPA Regional staff, and EPA Headquarters staff.

The codes referred to in this document are those printed on the reverse of the EPA-1 form, Item 32a. An attempt was made to group the unit processes on the EPA-1 form under liquid and sludge processes. These were further broken into various categories - i.e., primary, secondary, advanced wastewater treatment (AWT), etc. The order in which the unit processes are listed on the EPA-1 form is the order in which they are listed in this document, with one exception. Several new unit processes have been added to the EPA-1 form for the 1982 Survey. The new processes are listed under the miscellaneous category on the EPA-1 form. In this document the new processes have been placed in the category with which they are most closely associated. The new processes are listed below along with the page on which they may be found in this document.

<u>Item 32a Code</u>	<u>Unit Process</u>	<u>Page</u>
A5	Imhoff Tanks	5
A6	Septic Tanks	31
A7	Electrodialysis	24
A8	Reverse Osmosis	24
A9	Pressure Filters	24
AA	Seepage Lagoons (Evaporation Lagoons)	31
AB	Rock Filters	31
AC	Polymer Added to Liquid Stream	25
AD	Polymer Added to Sludge Stream	37

It should be pointed out that the category which a specific unit process is listed under is the most common and does not imply that process cannot be used in another category. For example, Codes 27 and 43 are physical/chemical treatment processes listed under the general AWT heading. Either can be, and usually are, part of a secondary plant. The fact that they are listed under AWT and used for coding a secondary plant will in no way imply, for Survey purposes, that the plant is an AWT facility.

The investigators and reviewers are urged to follow these conventions outlined herein for Needs Survey purposes.

LIQUID TREATMENT PROCESSES

PRIMARY TREATMENT

- 01 - Pumping, Raw Wastewater
- 02 - Preliminary Treatment - Bar Screen
- 03 - Preliminary Treatment - Grit Removal
- 04 - Preliminary Treatment - Commminutors
- 05 - Preliminary Treatment - Others
- 06 - Scum Removal
- 07 - Flow Equalization Basins
- 08 - Preaeration
- 09 - Primary Sedimentation
- A5 - Imhoff Tanks

SECONDARY TREATMENT

TRICKLING FILTER

- 10 - Trickling Filter - Rock Media
- 11 - Trickling Filter - Plastic Media
- 12 - Trickling Filter - Redwood Slats
- 13 - Trickling Filter - Other Media

ACTIVATED SLUDGE

- 14 - Activated Sludge - Conventional
- 15 - Activated Sludge - High Rate
- 16 - Activated Sludge - Contact-Stabilization
- 17 - Activated Sludge - Extended Aeration
- 18 - Pure Oxygen Activated Sludge

OTHER SECONDARY

- 19 - Bio-Disc (Rotating Biological Contactor)
- 20 - Oxidation Ditch Using Mechanical Aerators
- 21 - Clarification Using Tube Settlers
- 22 - Secondary Clarification

ADVANCED WASTEWATER TREATMENT (AWT)

BIOLOGICAL TREATMENT

- 23 - Biological Nitrification - Separate Stage
- 24 - Biological Nitrification - Combined BOD and Nitrification
- 25 - Biological Denitrification
- 26 - Post Aeration (Reaeration)

PHYSICAL/CHEMICAL TREATMENT

- 27 - Microstrainers - Primary
- 28 - Microstrainers - Secondary
- 29 - Sand Filters
- 30 - Mix-Media Filters (Sand and Coal)
- 31 - Other Filtrations
- 32 - Activated Carbon - Granular
- 33 - Activated Carbon - Powdered
- 34 - Two Stage Lime Treatment of Raw Wastewater
- 35 - Two Stage Tertiary Lime Treatment
- 36 - Single Stage Lime Treatment of Raw Wastewater
- 37 - Single Stage Tertiary Lime Treatment
- 38 - Recarbonation
- 39 - Neutralization
- 40 - Alum Addition to Primary
- 41 - Alum Addition to Secondary
- 42 - Alum Addition to Separate Stage Tertiary
- 43 - Ferri-Chloride Addition to Primary
- 44 - Ferri-Chloride Addition to Secondary
- 45 - Ferri-Chloride Addition to Separate Stage Tertiary
- 46 - Other Chemical Additions
- 47 - Ion Exchange
- 48 - Breakpoint Chlorination
- 49 - Ammonia Stripping
- 50 - Dechlorination
- A7 - Electrodialysis
- A8 - Reverse Osmosis
- A9 - Pressure Filters
- AC - Polymer Added to Liquid Stream

DISINFECTION

- 51 - Chlorination for Disinfection
- 52 - Ozonation for Disinfection
- 53 - Other Disinfection

LAND TREATMENT

- 54 - Land Treatment of Primary Effluent
- 55 - Land Treatment of Secondary Effluent (30/30)
- 56 - Land Treatment of Intermediate Effluent (Less Than Secondary)

OTHER

- 57 - Stabilization Ponds
- 58 - Aerated Lagoons
- 59 - Outfall Pumping
- 60 - Outfall Diffuser
- 61 - Effluent to Other Plants (And/Or Industry)
- 62 - Effluent Outfall

- 63 - Other Treatment
- 64 - Recalcination
- A6 - Septic Tanks
- AA - Seepage Lagoons (Evaporation Lagoons)
- AB - Rock Filters

SLUDGE PROCESSES

TREATMENT

- 65 - Aerobic Digestion - Air
- 66 - Aerobic Digestion - Oxygen
- 67 - Composting
- 68 - Anaerobic Digestion
- 69 - Sludge Lagoons
- 70 - Heat Treatment
- 71 - Chlorine Oxidation of Sludge (Purifax)
- 72 - Lime Stabilization
- 73 - Wet Air Oxidation
- 74 - Air Drying
- 75 - Dewatering - Mechanical - Vacuum Filter
- 76 - Dewatering - Mechanical - Centrifuge
- 77 - Dewatering - Mechanical - Filter Press
- 78 - Dewatering - Others
- 79 - Gravity Thickening
- 80 - Air Flotation Thickening
- AD - Polymer Addition to Sludge Stream

INCINERATION

- 81 - Incineration - Multiple Hearth
- 82 - Incineration - Fluidized Beds
- 83 - Incineration - Rotary Kiln
- 84 - Incineration - Others
- 85 - Pyrolysis
- 86 - Co-Incineration with Solid Waste
- 87 - Co-Pyrolysis with Solid Waste
- 88 - Co-Incineration - Others

DISPOSAL

- 89 - Land Fill
- 90 - Land Spreading of Liquid Sludge
- 91 - Land Spreading of Thickened Sludge
- 92 - Trenching
- 93 - Ocean Dumping
- 94 - Other Sludge Handling
- 95 - Digest Gas Utilization Facilities

MISCELLANEOUS

- 96 - Control/Lab/Maintenance Building
- 97 - Fully Automated Using Digital Controls (Compter)
- 98 - Fully Automated Using Analog Controls
- 99 - Semi-Automated Plant
- A1 - Manually Operated and Controlled Plant
- A2 - Package Plant
- A3 - Semi-Package Plant
- A4 - Custom Built Plant

DETAILED EXPLANATIONS - ITEM 32a

(Treatment and Sludge Handling)

for

EPA-1 FORM 1982 NEEDS SURVEY

LIQUID TREATMENT PROCESSES

PRIMARY TREATMENT

CODE 01 - PUMPING, RAW WASTEWATER

Use: To pump untreated wastewater to the headworks of a wastewater treatment plant.

Explanation: These pump stations are not to be confused with lift stations as used in the collection system, although in many cases they are identical mechanically. They are an integral part of the treatment plant, and often are preceded by certain other unit processes - bar screens, etc. to protect the pump impellers.

Notes:

CODE 02 - PRELIMINARY TREATMENT - BAR SCREEN

Use: To remove large materials from the raw wastestream prior to other unit processes.

Explanation: Bar screens are common to most treatment plants. They are used to remove large floating materials (rags, wood, etc.). They are inclined bars spaced for openings between bars of 3/4" to 3". The materials caught on the bars are removed by manual or mechanical rakes and disposed of as a solid waste.

Trashracks are similar to bar screens, but usually have larger spaces between bars. They are more commonly used in combined sewer systems where flows are high and the chance for street debris (branches, wood, etc.) is greater. The 1982 Survey should code trashracks as Code 02.

Notes:

CODE 03 - PRELIMINARY TREATMENT - GRIT REMOVAL

Use: To remove sand, stones, and non-colloidal dirt particles.

Explanation: A grit chamber is designed to remove materials of specific gravity greater than 2.0 and of sufficient size to be settleable (not colloidal). Removal is based strictly upon gravity separation. The primary purpose of the process is to prevent these materials from interfering with subsequent unit processes, yet not removing any organic materials.

Grit chambers are specified for most plants greater than 2.0 MGD in capacity, and for all plants receiving wastes from a combined sewer system (because of the large quantities of sand and dirt originating from city streets).

The removed grit is normally washed and put into a sanitary landfill for final disposal.

Some grit chambers are aerated. They should not be confused with any other type of preaeration process.

Notes:

CODE 04 - PRELIMINARY TREATMENT - COMMINUTORS

Use: To cut and shred large materials to allow more complete treatment in subsequent unit processes.

Explanation: Comminutors usually combine the shredding function with built in screens. They are normally installed downstream of the grit chamber (to reduce wear on cutting blades) and upstream of pumps.

As noted, screens are often an integral part of the comminutor so a bar screen will not always be located in the same plant.

Notes:

CODE 05 - PRELIMINARY TREATMENT OTHER

Use: To physically prepare the wastewater for subsequent unit processes.

Explanation: Although some of the codes which follow in later sections are often used for preliminary treatment (scum removal, flotation, equalization), any device which physically prepares the waste for primary, secondary, or advanced waste treatment processes should be included. If Code 05 is used, an explanation should be entered on the reverse of the EPA-1 form.

Notes:

CODE 06 - SCUM REMOVAL

Use: To remove grease, oils, and other floating materials from the wastestream.

Explanation: Specific devices for scum removal will be included in other codes below (preaeration, flotation, etc.). Except in unusual cases, scum removal is an integral part of all sedimentation/clarification tanks. This code will be used only if the unit process is designed to remove scum or foam from the main flow and is not part of another unit process.

Notes:

CODE 07 - FLOW EQUALIZATION BASINS

Use: To allow unequal flow rates to the wastewater plant headworks to be dampened so that equal flows are treated in subsequent unit processes.

Explanation: Flow equalization is not a treatment process in itself, but a technique used to improve a subsequent biological, chemical, and physical processes. They are normally located downstream of the preliminary processes explained above and upstream of secondary unit

processes. They are usually aerated to preclude the untreated wastes from becoming septic and to provide mixing. Thus, they can serve as a preaeration step. Code 08, Preaeration, should not be used if the basin's primary function is flow equalization, even though the latter performs preaeration. If the detention time of the basin is greater than 2.0 hours based upon design flow, the unit is to be considered an equalization basin. If it has a detention time of less than 2.0 hours, it is to be considered a preaeration basin (see Code 08).

Notes:

CODE 08 - PREAERATION

Use: A preliminary treatment of wastewater consisting of aeration to remove gases, add oxygen, promote floation of grease, and aid coagulation.

Explanation: Preaeration alone, without consideration to flow equalization, is rarely designed into plants but will be found in the inventory of older plants. Engineering judgment will be required to decide whether Code 07 or 08 is used. As a general rule, if the detention time of the basin is less than two hours (based upon design flow), the unit is a preaeration basin.

These units should not be confused with aerated grit chambers.

Notes:

CODE 09 - PRIMARY SEDIMENTATION

Use: To remove the majority of the particles of a non-colloidal nature from the main wastestream.

Explanation: Organic and inorganic settleable solids are removed by this process from the main wastestream and are classified as primary sludge. The primary sludge is treated by various sludge processes, usually with sludges produced by other unit processes. The liquid wastestream, containing water, dissolved organics and inorganics, and colloidal particles is treated by subsequent unit processes.

If no additional treatment other than disinfection is present prior to discharge to the environment from this process, the plant is considered a primary plant. Most package plants and extended aeration plants will not have primary sedimentation as a unit process.

Notes:

CODE A5 - IMHOFF TANKS

Use: A variation of a septic tank designed for relatively small flows. The tanks are separated into two chambers - a sludge chamber and a sedimentation chamber.

Explanation: Imhoff tanks are rarely installed at this time, but many exist in small communities which were built in the past. The accumulated sludge from the sludge chamber undergoes anaerobic digestion (depending upon ambient temperatures). The clarified wastewater is discharged directly as a primary effluent. These units resemble a two-story septic tank.

Notes:

SECONDARY TREATMENT

TRICKLING FILTER

CODE 10 - TRICKLING FILTER - ROCK MEDIA

Use: A biological treatment process, operating under aerobic conditions, whereby microorganisms remove and oxidize organic materials. The organisms attach themselves to the rocks and the wastewater trickles over them.

Explanation: A trickling filter is a misnomer since no filtering action, in a physical sense, occurs. The rocks, and the appropriate application of the wastewater, are simply an ideal environment for the organisms which

will oxidize (treat) the wastewater. All trickling filters require a clarification step (often referred to as secondary sedimentation) immediately downstream of the filter. The secondary clarifier is considered part of Code 10 and should not be coded separately.

There are many variations to a trickling filter - single stage, two stage, roughing. Regardless of the number of stages, Code 10 should be used.

If the type of media is unable to be determined, rock media will be assumed.

Notes:

CODE 11 - TRICKLING FILTER - PLASTIC MEDIA

Use: Identical to Code 10, except synthetic media made of plastic is used rather than rock.

Explanation: See Code 10.

Notes:

CODE 12 - TRICKLING FILTER - REDWOOD SLATS

Use: Identical to Code 10, except redwood slats are used as media rather than rock.

Explanation: See Code 10.

Notes:

CODE 13 - TRICKLING FILTER - OTHER MEDIA

Use: Identical to Code 10, except medium other than rock, plastic, or redwood is used.

Explanation: See Code 10. If Code 13 is used, the type of media should be specified under Comments on the reverse of the EPA-1 form.

Notes:

ACTIVATED SLUDGE

CODE 14 - ACTIVATED SLUDGE - CONVENTIONAL

Use: To aerobically treat organic wastewater by a technique in which the wastewater and a biological sludge (made up of microorganisms) are agitated and aerated.

Explanation: Activated sludge refers to the microorganisms (bio-mass) formed by the organisms using the organic wastes as a growth media. Under proper operation, the sludge readily settles under quiescent conditions and is recirculated to the aeration tank.

Most, if not all, biological oxidation occurs in the aeration tank. Air is used for the necessary oxygen and is usually diffused into the sludge at the bottom of the aeration tank. Surface mechanical aerators are also used in the activated sludge process.

Conventional activated sludge is one of many variations of the process which may be identified by a combination of the hydraulic flow and detention time, among other factors. A normal part of the system is a secondary clarifier. The process is usually considered to be conventional if the detention time in the aeration basin, based upon design flow, is approximately four hours. Further, the untreated waste enters the aeration tank on one end and flows through it as "plug flow."

A number of other names are used for variations of the conventional activated sludge process. These are "tapered aeration," "complete mix," "step aeration," etc. If the detention time is approximately 3-7 hours in the aeration basin and no other specific codes are appropriate, use Code 14.

Notes:

CODE 15 - ACTIVATED SLUDGE - HIGH RATE

Use: Same as Code 14, but efficiency of this process is usually less than conventional.

Explanation: The term "high rate" refers to the loading of waste to the aeration tank, i.e., it is loaded at a high rate, thus a shorter detention time than conventional - usually about 1.5 - 2.5 hours. The lower detention time inhibits the level of treatment as compared to conventional activated sludge.

Notes:

CODE 16 - ACTIVATED SLUDGE - CONTACT STABILIZATION

Use: Same as Code 14, but usually used to increase the capacity of an existing conventional activated sludge plant.

Explanation: This process uses two aeration tanks and a clarifier as opposed to a single aeration tank and clarifier as in conventional activated sludge. Settled activated sludge is mixed with the raw wastewater and aerated for approximately 30 minutes and is then subjected to clarification. The microbiological action occurring in the first aeration step is basically adsorption and absorption. The mixture is settled and the concentrated activated sludge is then subjected to another 3-4 hours of aeration during which time microorganisms actually metabolize (oxidize) the organic wastes.

Notes:

CODE 17 - ACTIVATED SLUDGE - EXTENDED AERATION

Use: Same as Code 14.

Explanation: The primary difference between extended aeration and conventional activated sludge is detention time, which is usually 20-24

hours for the former. Because of this long time, and the larger amount of land area required, this process is usually found only in small plants (less than 500,000 gallons per day). Nearly all activated sludge package plants use this modification.

Efficiencies are usually quite good and some aerobic digestion often occurs.

Most extended aeration plants do not require primary sedimentation basins; the raw waste entering the aeration tank immediately following comminution.

If ammonia removal is required to meet a NPDES permit, Code 24 should also be used.

Notes:

CODE 18 - PURE OXYGEN ACTIVATED SLUDGE

Use: Same as Code 14.

Explanation: Pure oxygen, generated on site, is used in the activated sludge process instead of air, which is only 20 percent oxygen. The basic biochemical reactions are the same as other types of activated sludge with this exception. The use of this process came into application about 1970.

Notes:

OTHER SECONDARY

CODE 19 - BIO-DISC (ROTATING BIOLOGICAL CONTACTOR)

Use: Aerobic biological waste treatment system.

Explanation: The bio-disc (which is a trade name) is officially termed the rotating biological contactor (RBC). The principal of this unit is very similar to that of a trickling filter depending upon the surface area of the discs and the flow through the treatment plant. Removal of BOD, suspended solids, and ammonia can be achieved, but the extent of removal depends on the number of discs. The principal of operation is the microorganisms grow on large discs which are rotated through the sewage. Thus, when the discs, which have over 50 percent of their surface area

exposed to the atmosphere at any time, are within the liquid media, the microorganisms absorb the organic materials. While the discs are exposed to the atmosphere, oxygen is transferred. They are usually considered a secondary aerobic biological treatment method. The discs are normally made of plastic and are 10-15 feet in diameter. The system is modular, that is, if greater efficiency is required more discs (surface area and, therefore, microorganisms) are added in series.

Notes:

CODE 20 - OXIDATION DITCH USING MECHANICAL AERATORS

Use: A secondary aerobic biological treatment method normally equivalent to the extended aeration modification of the activated sludge process (see Code 17).

Explanation: The oxidation ditch is simply an activated sludge plant accompanied by a secondary clarifier and sludge return which has an unusual configuration resembling a race track. The oxygen is transferred by a surface mechanical aeration device similar to a large paddle wheel. It should be considered one of the modifications of the activated sludge process.

Notes:

CODE 21 - CLARIFICATION USING TUBE SETTLERS

Use: Plain sedimentation of flocculant material.

Explanation: Tube settlers are simply a refinement on the theory of plain sedimentation. Equivalent to tube settlers are plate settlers. A tube settler has an advantage over the normal clarifier or sedimentation tank (Code 09 and 22) because it will be as efficient in removal characteristics as a larger conventional device. They are also built into certain other unit processes to effect sedimentation.

Tube settlers are often found in an older upgraded plant.

Notes:

CODE 22 - SECONDARY CLARIFICATION

Use: Gravity sedimentation not an integral part of other processes.

Explanation: This code should be used for special situations where the required clarification is not an integral part of other unit processes such as primary sedimentation or those clarifiers used with trickling filters or activated sludge units. Examples are clarification before or after lagoons, after chemical additions (usually AWT), etc.

Notes:

AWT

BIOLOGICAL TREATMENT

CODE 23 - BIOLOGICAL NITRIFICATION - SEPARATE STAGE OR SECOND STAGE ACTIVATED SLUDGE

Use: To oxidize nitrogen compounds in a wastewater.

Explanation: Nitrification is the process of taking nitrogen and its compounds to their oxidized state, which is the nitrate ion (NO_3). This process is most often used in municipal wastewater treatment in those cases where an ammonia removal requirement exists, without the need for complete nitrogen removal. The nitrification process uses oxygen. Therefore, in a biological unit process the wastewater must be aerated for long periods of time with the proper microorganisms in the activated sludge to attain the desired level of nitrification. It should be mentioned that some biological treatment processes, predominately extended aeration activated sludge and certain modifications of trickling filters, will produce a highly nitrified effluent. As a separate stage in a conventional treatment plant, the wastewater is aerated for a longer time

than would normally be expected. It is relatively rare to have biological nitrification as a separate unit process following conventional secondary treatment. However, it is often used as an initial step in the biological denitrification stage of wastewater (see Code 25).

Included in part of the system is a final clarifier.

Code 23 should be used only when the process is a completely separate stage.

Notes:

CODE 24 - BIOLOGICAL NITRIFICATION - COMBINED BOD AND NITRIFICATION OR EXTENDED AERATION

Use: Same as Code 23.

Explanation: Since biological nitrification takes place during the aerobic processes of biological waste treatment, both activated sludge and trickling filtration, the BOD and other organic constituents are removed at the same time the nitrogen compounds, particularly ammonia, are oxidized to nitrate. The treatment plants are virtually indistinguishable from a normal activated sludge or trickling filter plant although their operational characteristics and procedures are often modified to effect the nitrification step. Again, many types of activated sludge plants are not amendable to combined BOD and nitrification because of short detention times or relatively high organic loads which will preclude nitrification.

A normal part of the system is a final clarifier.

This code should only be used when engineering documentation shows that the plant has been designed for nitrification.

Notes:

CODE 25 - BIOLOGICAL DENITRIFICATION

Use: To remove nitrogen, in the form of nitrogen gas, from wastewater.

Explanation: In municipal applications, the nitrogen in the raw wastewater is primarily present as organic and ammonia nitrogen and first must be converted to an oxidized form (nitrite or nitrate) prior to

biological denitrification. Nitrification has been discussed under Codes 23 and 24. Denitrification by biological methods is a biological process carried out in the absence of free oxygen (anaerobic). The organisms require oxygen for their metabolism, which they obtain from the nitrate ion. Thus, the oxygen is removed and nitrogen gas is released. This gas, which is only slightly soluble and inert, goes out of solution into the atmosphere.

The process can be used in a fluid system, such as a closed agitated tank, or the organisms can grow on a porous media in the absence of oxygen. A source of carbon is necessary in the process as an energy source for the organisms.

Code 25 should only be used when a true biological denitrification unit process is a part of the treatment train.

Notes:

CODE 26 - POST AERATION (REAERATION)

Use: To add oxygen to a water immediately prior to discharge into the receiving waters.

Explanation: Many processes have a final effluent which is very low in dissolved oxygen or one that contains some gases which can be purged from the water mass. If this is the case, aerating the water by either diffused aeration or surface aeration immediately prior to discharge into the receiving waters will add oxygen and/or remove other gases. This process is most commonly found in water quality limited receiving stream areas where the magnitude of the discharge is large when compared to the magnitude of the design low flow of the receiving waters.

No biological activity, and, therefore, no treatment occurs in this process. It is truly a physical process.

Notes:

PHYSICAL/CHEMICAL TREATMENT

CODE 27 - MICROTRAINERS - PRIMARY

Use: To remove, by filtration, suspended solids from a wastestream.

Explanation: Microtrainers, Microscreens, or Microsieves are true filtering devices, usually made from cloth placed on a drum or accurately spaced metal structures. The effective pore size determines their efficiency and their basic use. These units can be used as a substitute for, or a polishing step after, gravity sedimentation.

If the material screened is untreated waste or effluent from primary sedimentation, Code 27 is to be used.

Notes:

CODE 28 - MICROTRAINERS - SECONDARY

Use: Same as Code 27.

Explanation: Code 28 is used when the microtrainers act as a polishing step after normal secondary treatment to remove suspended solids carried over from the secondary clarification process. Code 28 should be entered when microtrainers are used to polish lagoon effluent, all secondary processes, and all AWT processes.

Notes:

CODE 30 - MIX-MEDIA FILTERS (SAND AND COAL)

Use: Same as Code 29.

Explanation: Dual-media, multi-media, or mix-media filters consist of two or more materials of different specific gravities and sizes (usually sand, anthracite, and garnet) which, when properly constructed, increase the effective depth (and removal efficiencies) of the filter.

Code 30 should be used for any filter with more than one media. Their uses are the same as Code 29.

If filter is a pressure filter, also use Code A9.

Notes:

CODE 31 - OTHER FILTRATIONS

Use: Same as Code 29.

Explanation: Any granular material can be used as a filter medium. The most common are identified by Codes 29 and 30. Filters have been constructed of diatomaceous earth, perlite, and activated carbon. If Code 31 is used on the Survey, the type of media should be noted on the reverse of the EPA-1 form.

If filter is a pressure filter, also use Code A9.

Notes:

CODE 32 - ACTIVATED CARBON - GRANULAR

Use: To remove residual organics (refractory organics) that are resistant to biological or other treatment.

Explanation: Activated carbon removes colloidal and dissolved particles by the surface phenomenon known as adsorption. The process is often used in AWT applications. When granular carbon is used, as opposed to powdered (see Code 33) carbon, it is considered an individual unit. Physically, the unit is constructed similar to either a gravity or pressure filter with ancillary equipment installed for backwashing, etc.

Notes:

CODE 33 - ACTIVATED CARBON - POWDERED

Use: Same as Code 32.

Explanation: Because of physical limitations, powdered activated carbon is not a unit process, but is added to the wastestream, completely mixed, and removed by sedimentation in a subsequent unit. The reaction, and its use, is the same as using a carbon bed.

When powdered carbon is used, it will be normal to find other chemical additions specified, and, depending upon where it is added, a separate clarification step (Code 22) might be specified.

Notes:

CODE 34 - TWO STAGE LIME TREATMENT OF RAW WASTEWATER

Use: To remove phosphorus from a wastewater.

Explanation: For technical reasons which are made apparent under the explanation for Two Stage Tertiary Lime Treatment - Code 35, this treatment process is rarely, if ever, seen in practice. An alternate name would be "High Lime Treatment of Raw Wastewater." High lime treatment is defined as the addition of sufficient lime in primary facilities to achieve a pH equal to or greater than 11. The lime is added immediately prior to the primary sedimentation tank of an activated sludge plant, and because of the insolubility of calcium phosphate compounds at a high pH, the phosphates are removed during sedimentation or during the aeration step. Refer to Code 35 below for further explanation on some of the chemistry of phosphate removal by lime.

For purposes of the Survey, high lime additions before the primary clarifier on activated sludge plants will be marked as Code 34. Should true two stage lime treatment of raw wastewaters, as defined under Code 35, be utilized, they will also be Coded 34. Under the latter, there will be no biological processes.

Notes:

CODE 35 - TWO STAGE TERTIARY LIME TREATMENT

Use: To remove phosphorus from secondary effluent.

Explanation: The process specified as two stage lime treatment implies that its purpose is to remove phosphorous compounds. It will be noted that many other unit processes, specified by separate codes, make up the train for this code. These units consist of chemical feed, rapid mixer, flocculator, clarification, recarbonation, clarification, and recarbonation, in that order, often followed by filtration.

The basic theory of the process is to raise the pH above 11 by lime addition at which point calcium phosphate compounds are insoluble and are removed by the first sedimentation step. Recarbonation of the clarifier effluent then occurs (see Code 38 for explanation of recarbonation) to lower the pH to about 10, at which point the calcium carbonate present is insoluble.

This compound is removed by the second clarifier and the liquid is again recarbonated to further lower the pH to effect chemical stabilization and to comply with effluent restrictions.

As mentioned above, it is considered very unusual to use this treatment process on raw wastewaters. When it is specified, use Code 35 only - do not use separate codes for each clarifier, recarbonation step, etc.

(This treatment process is identical to the so-called excess lime treatment used in water treatment plants where water softening is the objective.)

Notes:

CODE 36 - SINGLE STAGE LIME TREATMENT OF RAW WASTEWATER

Use: To remove phosphorus from a wastewater.

Explanation: Sufficient lime is added to raise the pH to approximately 10, at which point the phosphorous compounds are removed by sedimentation. Single stage rather than two stage is used as a function of the wastewater chemical characteristics. Like the two stage process, single stage lime treatment is generally used only on secondary effluent. However, lime is often added to a primary waste - to the primary settling tank of an activated sludge plant - to remove phosphorus by the same chemical mechanisms. If lime is added to bring the pH of the waste to approximately 10, a great deal of the phosphorus will be removed. Therefore, the normal nomenclature for lime addition under such a situation would be low lime treatment.

Code 36 should be used when low lime treatment is used - that is, if lime is added to the raw wastewater to raise it to a pH of 10 prior to the primary sedimentation step of a secondary biological treatment plant. This situation is analogous to that described under Code 34.

Notes:

CODE 37 - SINGLE STAGE TERTIARY LIME TREATMENT

Use: To remove phosphorus from a secondary effluent.

Explanation: This is a common process which, like Code 36, raises the pH of the wastestream to approximately 10.0 at which point the phosphorus chemically reacts with the lime to form an insoluble and settleable compound which is subsequently removed by sedimentation or filtration. It is most commonly used after biological secondary treatment methods (activated sludge or trickling filters).

Notes:

CODE 38 - RECARBONATION

Use: To reduce pH and to precipitate excess lime.

Explanation: In any treatment process which uses lime as a chemical additive, the lime enters the water and dissociates as a calcium ion and an hydroxyl OH ion. The latter will raise the pH of the water to a point which would be detrimental to the receiving water. In addition, significant amounts of calcium are also present which, depending upon other characteristics of the water, may make the resulting water chemically unstable. If gaseous carbon dioxide is added to a solution whose pH is high due to lime addition, the resultant reactions will remove both the calcium and the OH ion by forming calcium carbonate and water. The calcium carbonate will be insoluble and thus become a precipitate which can be removed by sedimentation or filtration, and the pH will be lowered.

Recarbonation is employed as a unit process in both single and two stage lime treatment, as well as in some unique situations. When single or double stage lime treatment is specified by Codes 35 or 37, it is understood that recarbonation is one of the unit processes and need not be coded on the EPA-1 form separately.

Notes:

CODE 39 - NEUTRALIZATION

Use: To raise or lower the pH of a raw or treated wastewater to acceptable limits.

Explanation: Neutralization is the addition of a chemical, usually either an acid for strongly basic waters or a base for strongly acidic waters, and occasionally a buffer for either acidic or basic waters, which will cause the resultant water to have a predetermined pH close to 7.0. This pH adjustment is most commonly done as a pretreatment step at its source prior to its reaching a community's collection and/or treatment system. However, there are instances where the pH of an incoming sewage must be adjusted close to neutral so that the waste will not interfere with subsequent treatment processes. If a chemical is added strictly for pH adjustment, Code 39 should be used, and identified under the Comments section on the reverse of the EPA-1 form.

Although Recarbonation - Code 38 - is a pH adjustment step, occasionally the pH of an effluent must be adjusted to make it compatible with a receiving water. If the pH of the effluent is adjusted by the addition of either an acid, a base, or a buffer for this reason, Code 33 should also be used, except when Code 38 is used.

Notes:

CODE 40 - ALUM ADDITION TO PRIMARY

Use: To enhance phosphorous removal and to coagulate suspended materials from a raw wastewater.

Explanation: Alum (aluminum sulfate) and other aluminum compounds are added to a wastewater as a coagulant. Chemical coagulation involves the aggregation of small particles into large, more readily settleable

conglomerates. In addition, aluminum reacts with many forms of phosphorus to create an insoluble compound which is readily removable by sedimentation or filtration.

Code 40 should be used when alum or other aluminum compounds (such as sodium aluminate) are added prior to other primary sedimentation units.

Notes:

CODE 41 - ALUM ADDITION TO SECONDARY

Use: Same as Code 40.

Explanation: Because of the physical configuration of treatment plants or other engineering considerations, aluminum salts are often added at the influent to the secondary unit process, which is normally the aeration tank of an activated sludge system. This stage will perform the required mixing, and the coagulant will settle in the secondary clarifier.

Notes:

CODE 42 - ALUM ADDITION TO SEPARATE STAGE TERTIARY

Use: To remove phosphorus and residual turbidity/suspended solids from a secondary effluent.

Explanation: Alum addition following secondary treatment is performed to remove the phosphorus which can be precipitated by an aluminum salt and is virtually a complete treatment plant in itself consisting of chemical addition, mixing, flocculation, and sedimentation. Filtration often is specified also. In plants with this process, other chemicals are often added, such as lime or certain coagulant aids or polyelectrolytes (see Code AC).

Should alum be added as a separate stage, all unit processes for the stage should be identified - clarifier (Code 22), filters, etc.

Notes:

CODE 43 - FERRI-CHLORIDE ADDITION TO PRIMARY

Use: Same as Code 40.

Explanation: Iron salts (ferric chloride, ferric sulfate, ferrous chloride, and ferrous sulfate) are all widely used and often interchangeable for coagulation/precipitation reactions in waste treatment. Their use and their reactions are virtually identical to those for alum or aluminum slats. The choice of which mineral salt to be used is dependent upon chemical characteristics of the wastewater and is usually determined by a series of jar tests.

Notes:

CODE 44 - FERRI-CHLORIDE ADDITION TO SECONDARY

Use: Same as Code 41.

Explanation: See explanation, Code 43.

Notes:

CODE 45 - FERRI-CHLORIDE ADDITION TO SEPARATE STAGE TERTIARY

Use: Same as Code 42.

Explanation: See explanation, Code 43.

Notes:

CODE 46 - OTHER CHEMICAL ADDITIONS

Use: To cause chemical precipitation and coagulation or to remove exotic (unusual) compounds.

Explanation: Chemicals other than alum, iron salts, or carbon dioxide are occasionally used to effect precipitation or other chemical reactions in the treatment scheme. If such chemical processes are used, they should be identified with a Code 46 and the chemical identified in the Comments block.

Polymers and polyelectrolyte additives used as a coagulant aid should be Coded as AC (see below)

Notes:

CODE 47 - ION EXCHANGE

Use: To remove specific ions by chemical exchange.

Explanation: An ion-exchange system consists of the exchange resin with provisions for regeneration. This is the same process used for softening water in a home. In recent years the practice in the field of wastewater treatment has primarily been for the removal of ammonium ions by a selective ion-exchange resin. Few practical applications on a widespread basis for the removal of other nitrogen forms besides ammonia or for phosphorous compounds exist. In recreational areas the process has found use in the removal of certain heavy metal ions discharged from camper holding tanks.

Notes:

CODE 48 - BREAKPOINT CHLORINATION

Use: To remove the ammonium ion from a wastewater, converting it to nitrogen gas.

Explanation: When chlorine gas is added to dilute aqueous solutions containing ammonia nitrogen, reactions occur which may lead ultimately to oxidation of the ammonium ion into end products composed predominately of nitrogen gas. When such chemical processes are performed in water and wastewater treatment for the purpose of ammonium nitrogen removal, the procedure is termed breakpoint chlorination. The process is almost universally applied as an advanced unit process because addition of chlorine to a

solution containing large amounts of organics would require excessive amounts of chlorine to satisfy the normal chlorine demand of these organics. Thus one will never find this process applied to a raw wastewater. Code 48 should only be used for ammonia removal as an AWT unit process.

Notes:

CODE 49 - AMMONIA STRIPPING

Use: To remove the ammonium ion in the form of ammonia gas from a wastewater.

Explanation: The process removes gaseous ammonia from water. However, ammonia in a wastewater is rarely in the gaseous form and the ammonium ion can be converted to the gaseous form by raising the pH of the water to a very high level, preferably above 11. This is often performed during the various phosphorous removal stages which have been previously explained (such as various lime treatment processes). Once the pH is raised, the gaseous nitrogen is released from the water by agitation in the presence of air. This is strictly an AWT process, usually following most other processes which have removed the majority of the other contaminants in the wastewater.

Notes:

CODE 50 - DECHLORINATION

Use: To produce a chlorine-free effluent.

Explanation: Certain chlorine compounds have been shown to be detrimental to receiving waters. Some states and locations have specified that the effluents must be dechlorinated prior to discharge. Code 50 should be used only when a specific unit process is designed or called for to dechlorinate.

Notes:

CODE A7 - ELECTRODIALYSIS

Use: To demineralize (remove salts) from the treated wastewater.

Explanation: The wastewater flows between alternately placed cation permeable and anion permeable membranes. A direct current is supplied which causes the electromotive force for the ions to migrate through the membranes. The ions to be removed pass through the membrane separating in a partially demineralized effluent from a concentrated brine solution.

Notes:

CODE A8 - REVERSE OSMOSIS

Use: To demineralize (remove salts) from the treated wastewater.

Explanation: The process takes advantage of the phenomenon known as osmosis. Osmosis occurs where solutions of different concentrations are separated by a semipermeable membrane. Water passes through the membrane from the dilute to the more concentrated side producing an equal concentration on both sides. Reverse osmosis (RO) uses a pressure on the side of the membrane with a high salt concentration to reverse the osmotic pressure. Demineralized water is thus produced on the lower pressure side and a more concentrated brine remains on the pressure side.

Notes:

CODE A9 - PRESSURE FILTERS

Use: To remove suspended solids from a wastestream.

Explanation: Pressure filters are filters which operate at pressures greater than atmospheric. They can be up or down flow. The media can be sand, mixed, etc.

If the filter is a pressure filter, Code A9 should be entered as well as the type of media - Codes 29, 30, 31.

Notes:

CODE AC - POLYMER ADDED TO LIQUID STREAM

Use: To enhance coagulation of suspended particulates.

Explanation: Polymers (polyelectrolytes) are coagulation aids usually used in the liquid stream with the chemical processes described in Codes 40, 41, 42, 43, 44, 45, and 46. They enhance the agglomeration of settling properties of biological and chemical particulate matter.

Notes:

DISINFECTION

CODE 51 - CHLORINATION FOR DISINFECTION

Use: To kill disease-causing bacteria and viruses in an effluent stream.

Explanation: Chlorine, through a complex chemical reaction, acts as a disinfection media which, in proper dosages, kills bacteria and some viruses. It is a state law for nearly all effluents of a municipal sewage origin to be chlorinated or disinfected by other means prior to discharge into the environment. Code 51 will be found on nearly all treatment plants with a few exceptions (water quality limited streams). This code should not be confused with breakpoint chlorination, which is used for the sole purpose of removing ammonia gas.

Many parts of the country now require that effluents have no chlorine residual. Although chlorination is required for disinfection, a separate unit process to dechlorinate the effluent might be required. Code 50 should be used for dechlorination.

Notes:

CODE 52 - OZONATION FOR DISINFECTION

Use: Same as Code 51.

Explanation: Ozone, when mixed with a wastewater, has similar disinfection properties as does the addition of chlorine. It is used for the same purposes, but it does not create any harmful chemical derivatives. It will be found in use where chlorine cannot be used because of water quality considerations, but disinfection is specified.

Notes:

CODE 53 - OTHER DISINFECTION

Use: Same as Code 51.

Explanation: In rare instances other forms of disinfection can be used. These would include such things as heat treatment or certain types of radiation. When Code 53 is used, an explanation of the type of disinfection should be entered under Comments on the reverse of the EPA-1 form.

Notes:

LAND TREATMENT

CODE 54 - LAND TREATMENT OF PRIMARY EFFLUENT

Use: To use the land, by irrigation methods, to treat a primary effluent.

Explanation: When a primary effluent is applied to land by irrigation, it is truly land treatment in that the organics and much of the nutrients in the wastewater are converted to other forms by the growth of crops.

When using Code 54, it must be demonstrated that the land is available and can accept the waste load at the rate anticipated. Land treatment is relatively new in the United States and the use of land treatment of primary effluent (that which has only been subjected to sedimentation) is very strictly regulated.

The use of land must be demonstrated to be for treatment as differentiated from land disposal in order to use Code 54. For primary effluent, land application will nearly always be for treatment purposes.

Notes:

CODE 55 - LAND TREATMENT OF SECONDARY EFFLUENT (30/30)

Use: To treat a secondary effluent by land application.

Explanation: The effluent is discharged onto land by standard irrigation techniques and the water and nutrients remaining in the secondary effluent are used to grow crops which remove the nutrients prior to any water reaching the surface or groundwaters of the area.

Notes:

CODE 56 - LAND TREATMENT OF INTERMEDIATE EFFLUENT
(LESS THAN SECONDARY)

Use: Same as Codes 54 and 55.

Explanation: This is a special situation in which certain types of effluent which do not meet the 30/30 requirement but which have a greater degree of treatment than normal primary treatment are permitted to be discharged on the land as a land treatment process. Use of Code 56 will require engineering judgement and probably should not be used unless an approved system has been designed and documented.

Land treatment must be demonstrated.

Notes:

OTHER

CODE 57 - STABILIZATION PONDS

Use: To treat, by biological action, wastewater, usually to a degree less efficient than normal secondary biological processes.

Explanation: Stabilization ponds, also called lagoons or oxidation ponds, are large shallow ponds designed to treat the wastewater through the interaction of sunlight, wind, algae, and oxygen. The biological processes which take place in an oxidation pond for the removal of organic materials are very similar to those which take place in other biological processes, namely the activated sludge process and the trickling filter. Code 57 should be used for all such facilities whether they are classified as aerobic, facultative, or anaerobic. The latter, however, will be rare without other unit processes. This code should be used regardless of whether the treatment system consists of a single pond or a series of ponds or cells flowing in a series. The classification of lagoons as secondary treatment processes should be made in view of the regulations printed in the October 7, 1977 Federal Register.

Notes:

CODE 58 - AERATED LAGOONS

Use: Same as Code 57.

Explanation: Aerated lagoons are used as a treatment device, generally without primary sedimentation, and limited to approximately the same effluent characteristics as stabilization ponds (Code 57). The only difference is that they do not rely on natural processes, such as sunlight and algae, to produce the necessary oxygen, but add oxygen via aeration devices, either by diffused aeration from the bottom, or more commonly, surface aerators.

Notes:

CODE 59 - OUTFALL PUMPING

Use: To provide sufficient energy for the effluent to flow through the outfall.

Explanation: Usually outfalls have sufficient hydraulic head to allow gravity flow to their discharge point. When this is not the case, energy by pumping must be added. This process is virtually a pumping station at the discharge works of a treatment plant.

Notes:

CODE 60 - OUTFALL DIFFUSER

Use: To mix the effluent with the receiving waters and effect dilution to a greater extent than would be accomplished by simply discharging from the end of an open pipe.

Explanation: Diffusers are simply long pipes with orifices drilled into their sides which will discharge an effluent over a wide area to effect significant immediate dilution between the effluent and the receiving water. Most ocean outfalls have diffusers and many river and lake outfalls do also. These units are very expensive and are usually specified as to their need. Code 60 should not be utilized unless it can be ascertained that a true diffuser is installed or contemplated.

Notes:

CODE 61 - EFFLUENT TO OTHER PLANTS (AND/OR INDUSTRY)

Use: This is basically the effluent line where the effluent, instead of being discharged to some part of the environment, goes through another treatment plant. This can either be for effluent from a primary, secondary, AST or AWT facility.

Explanation: Effluents are not always discharged into the environment, either land or water, but are often transported to another treatment plant for further treatment, for water reuse, etc. Code 61 should only be used when the effluent goes to another treatment plant or is consumed by industry.

If effluent is reused/recycled, appropriate coding must be performed to indicate that this is a multiple-use project.

Notes:

CODE 62 - EFFLUENT OUTFALL

Use: To transport the treated waste from the last unit process of the treatment plant to and into the receiving water.

Explanation: Every treatment plant has an outfall with the exception of those where Code 59 is used or where the various land treatment and disposal schemes are utilized. The outfall denotes the pipe to a water course. In the situation where a diffuser is also specified, the diffuser will be attached to the end of the outfall. Therefore, both Codes 60 and 62 should be specified.

Notes:

CODE 63 - OTHER TREATMENT

Use: Any treatment process not specified by other codes.

Explanation: New, innovative, alternative or omitted treatment processes are to be coded with Code 63. When Code 63 is used, a notation as to the process and its use should be made under the Comments on the reverse of the EPA form.

Notes:

CODE 64 - RECALCINATION

Use: To recover lime used in lime treatment.

Explanation: The precipitate from single or two stage lime treatment is calcium carbonate. If this sludge is collected, it can be reconverted to lime (calcium oxide) and reused in the lime feed. The normal recalcination procedure is through oxidation of the calcium carbonate with heat.

Although the process can be used with Codes 34, 35, 36, and 37, it usually will not be found with Codes 34 or 36 because of the large quantities of interfering materials found in raw wastewaters.

Notes:

CODE A6 - SEPTIC TANKS

Use: An anaerobic treatment of single or multi-family domestic wastes, with liquid effluent to leach fields.

Explanation: The septic tank/leach field system is the prevalent disposal method for domestic wastes in unsewered areas with low population densities. Suspended solids are settled in the tank and subjected to anaerobic digestion. The liquid supernatant is discharged to the ground via a shallow leaching field. Sludge is periodically collected and transported to a treatment plant for ultimate disposal.

Notes:

CODE AA - SEEPAGE LAGOONS (EVAPORATION LAGOONS)

Use: To treat wastewaters as in any other lagoon (Code 57) but the lagoon is designed for no discharge.

Explanation: These lagoons are engineered in such a manner that normal treatment is effected but the lagoons are designed to allow seepage to occur at a predetermined rate. All effluent thus discharges to the groundwater.

In certain sections of the country (the arid parts of the west), evaporation is used for the same purpose - to create a no-discharge lagoon.

Notes:

CODE AB - ROCK FILTERS

Use: To remove suspended solids (usually algae) from lagoon systems.

Explanation: Porous rock dikes between cells of lagoons, or at the effluent of a lagoon, are installed to act as a rough filter. The wastewater flow through these rock filters removes a large percentage of the suspended materials.

Codes 57 or 58 must be used if Code AB is used.

Notes:

SLUDGE PROCESSES

TREATMENT

CODE 65 - AEROBIC DIGESTION - AIR

Use: To stabilize sludge (reduce sludge).

Explanation: The principal purpose of stabilization is to make the sludges from the various treatment processes less odorous and putrescible, and to reduce the pathogenic organism content. The amount of organic material present in the sludge is reduced. The process is normally used for waste organic sludges from trickling filters and activated sludge treatment units. The detention times are long and the concentration of solids high as compared to most other biological treatment processes. The normal procedure is to have a tank which is constantly agitated with diffused air very similar to the aeration tank of an activated sludge process, but it is considered a batch process versus a continuous flow process.

Notes:

CODE 66 - AEROBIC DIGESTION - OXYGEN

Use: Same as Code 65.

Explanation: This process is essentially identical to Code 65 except that pure oxygen is used in the digestion process rather than diffused air.

Notes:

CODE 67 - COMPOSTING

Use: Same as Code 65, as well as when used in conjunction with municipal solid waste, to produce a usable compost mixture for agricultural purposes.

Explanation: This is a rare process in the United States, with only 18 plants constructed between 1951 and 1969. The process is basically identical to that used in composting materials from one's garden. The sludge is mixed with a material to create bulk and it is mechanically turned at a predetermined interval to provide aeration. The microorganisms within the mixture decompose the sludge during a digestion period at a relatively high temperature until the material has become biologically stabilized.

Notes:

CODE 68 - ANAEROBIC DIGESTION

Use: Same as Code 65.

Explanation: Anaerobic digestion, as the name implies, consists of fermenting the organic sludges without the presence of oxygen. The sludges are metabolically broken down to their simplest substances which are either treated aerobically by the normal treatment plant or are biologically inert. This method of sludge stabilization is probably the most common in the United States and consists of many modifications - single stage, two stage, etc. One of the by-products of this process is methane gas which, if it is used within the plant as an energy source, should also be coded in conjunction with Code 95.

Like Codes 65-67, anaerobic digestion has basically a long detention time. It is a highly concentrated process which operates on a semi-batch basis.

Most sludges from organic treatment processes are amenable to anaerobic digestion. Sludges from various chemical/physical treatment processes are usually not.

Notes:

CODE 69 - SLUDGE LAGOONS

Use: To dry sludge.

Explanation: Lagoons are large ponds into which sludge is discharged and the moisture content is reduced through evaporation and/or infiltration. They are quite similar to sand-drying beds in principal, but larger. When the lagoon is dry, the sludge is normally removed and disposed elsewhere.

Notes:

CODE 70 - HEAT TREATMENT

Use: To stabilize/disinfect sludge.

Explanation: Heat treatment is normally a process used on a sludge derived from a domestic sewage which will subsequently be utilized for agricultural purposes and whose inherent microorganism population must be killed to preclude spread of infectious diseases. Heat treatment by itself is simply a disinfection and/or pasteurization process. It does little in terms of reducing the organic content of the material or changing its physical characteristics.

Notes:

CODE 71 - CHLORINE OXIDATION OF SLUDGE (PURIFAX)

Use: To stabilize/reduce sludge.

Explanation: This process utilizes heavy doses of chlorine to oxidize the sludge and to enhance the dewatering characteristics of the biologically stable end product. This is a proprietary process.

Notes:

CODE 72 - LIME STABILIZATION

Use: To stabilize/reduce organic sludges.

Explanation: Lime is added in sufficient quantities to the sludge to maintain a pH greater than 11.0 which destroys all pathogenic bacteria and stabilizes the sludge for future dewatering operations, such as sandbeds. The sludge remains stable as long as the pH remains high.

Notes:

CODE 73 - WET AIR OXIDATION

Use: To stabilize/reduce sludges.

Explanation: Wet air oxidation, which is also known as wet incineration, wet combustion, and wet oxidation, is simply the oxidizing of the organics in the presence of liquid water at temperatures between 250° and 700° F. It is particularly useful on waste liquors and sludges difficult to dewater where solids are a small percentage of the total mass. This process has been patented and marketed under the trade name Zimpro.

Notes:

CODE 74 - AIR DRYING

Use: To dewater sludge.

Explanation: This process is very similar to drying lagoons except that it is normally accomplished on drying beds which are basically sand filters underlain with drainage pipes to collect the liquid. The sludge air dries on top of the sand and is subsequently collected and ultimately disposed of elsewhere.

Notes:

CODE 75 - DEWATERING - MECHANICAL - VACUUM FILTER

Use: To dewater waste sludges.

Explanation: A vacuum filter is generally a large rotary filter using steel coils or a synthetic material as a filter medium to remove large amounts of water from the sludge for easier handling. Both biological and physical/chemical sludges are amenable to dewatering by vacuum filters.

Notes:

CODE 76 - DEWATERING - MECHANICAL - CENTRIFUGE

Use: Same as Code 75.

Explanation: Large industrial centrifuges of a continuous flow design take advantage of the difference in specific gravity of the sludges and the water to separate these two phases. The end result is a dewatered sludge of approximately the same consistency as that produced by a vacuum filter.

Notes:

CODE 77 - DEWATERING - MECHANICAL - FILTER PRESS

Use: Same as Code 75.

Explanation: A filter press essentially squeezes the sludge against a membrane allowing the water to pass through, be collected, and returned to the liquid phases of the treatment processes. The dewatered sludge is then transported to the next process or ultimate disposal site. The resultant sludge has a consistency similar to a vacuum filter end-product.

Notes:

CODE 78 - DEWATERING - OTHER

Use: Same as Code 75.

Explanation: Various types of units can be used to dewater, none of which are as popular as Codes 75, 76, or 77. Some are moving screen concentrators, belt pressure filters, capillary dewatering systems, and rotating gravity concentration. When Code 78 is used, an explanation of the type of dewatering mechanism should be noted under the Comments on the reverse of the EPA-1 form.

Notes:

CODE 79 - GRAVITY THICKENING

Use: To partially remove the water, or, conversely, to reduce the sludge volume to be stabilized, dewatered, or hauled away for final disposal.

Explanation: Gravity thickening is a very economical process to increase the concentration of sludge. Anaerobically digested primary sludge is normally thickened by gravity in the secondary digester and is considered part of the digestion process and should not be included in Code 79.

Code 79 is used only when a specific basin is designed into which sludge is placed and thickened.

Notes:

CODE 80 - AIR FLOTATION THICKENING

Use: Same as Code 79.

Explanation: Rather than mechanically stirring the sludge, air flotation techniques add small air bubbles to raise the sludge to the surface of a basin in a more concentrated condition than it would under sedimentation. This process usually involves the use of dissolved air flotation. It is becoming popular and will be seen on the more recent designs. This process should not be confused with the process called foam or froth flotation in which certain refractory compounds in wastes are removed by a dissolved air flotation technique.

Notes:

CODE AD - POLYMER ADDITION TO SLUDGE STREAM

Use: To condition sludge to enhance sludge dewatering processes.

Explanation: Polymers (polyelectrolytes) are complex organic chemical compounds which are added to sludges to increase the efficiencies of various sludge conditioning and dewatering processes.

Code AD must be used with Codes 74, 75, 76, 77, 78, 79, or 80.

Notes:

INCINERATION

CODE 81 - INCINERATION - MULTIPLE HEARTH

Use: To reduce sludge.

Explanation: The multiple hearth is the most widely used wastewater sludge incinerator in the United States today. It is basically a multi-layered series of grates through which the sludge flows as it is combusted. It is very similar to incinerators used for solid wastes.

Notes:

CODE 82 - INCINERATION - FLUIDIZED BEDS

Use: Same as Code 81.

Explanation: The fluidized bed incinerator is a vertical, cylindrical vessel with a grid in the lower section to support a sand bed. Dewatered sludge is injected above the grid while combustion air flows upward and fluidizes the mixture of hot sand and sludge. Supplemental fuel sometimes is required. In essence, the reactor is a single chamber unit where both moisture evaporation and combustion occur at approximately 1500° F in either the dense or dilute phases of the sandbed.

Notes:

CODE 83 - INCINERATION - ROTARY KILNS

Use: Same as Code 81.

Explanation: The rotary kiln incinerator is a large oven in which the sludge rotates around its longitudinal axis allowing the sludge to mix with combustion air which passes over it. Few rotary kilns are existent in the United States today for sludge reduction purpose.

Notes:

CODE 84 - INCINERATION - OTHERS

Use: Same as Code 81.

Explanation: If other incineration processes, such as flash drying, are specified, Code 84 should be used and a description of the process entered under the Comments on the reverse of the EPA-1 form.

Notes:

CODE 85 - PYROLYSIS

Use: Same as Code 81.

Explanation: Pyrolysis is a controlled combustion process. Unlike incineration, however, pyrolysis does not imply that a waste is being burned. The pyrolysis process requires raising the fuel to a temperature at which the volatile matter will distill, leaving carbon and inert material behind. The carbon and the volatiles do not burn in the process because the heating occurs in an oxygen deficient atmosphere. Volatile matter may be burned off as waste in a secondary chamber to which air is added, or the off-gas may be cooled and condensed to recover oils and tars, or cleaned and used as fuel. Pyrolysis reduces the sludge volumes and sterilizes the end product.

Notes:

CODE 86 - CO-INCINERATION WITH SOLID WASTE

Use: Same as Code 81 with added benefit of solid waste disposal.

Explanation: Both as a fuel source and as an economy move, many cities are incinerating their waste sludges in conjunction with solid wastes (refuse, garbage, trash, etc.). When any of the incineration processes above are used in conjunction with municipal solid wastes, Code 86 should be used in conjunction with the specific incineration code. Also, appropriate coding must be performed to indicate that this is a multiple-use project.

Notes:

CODE 87 - CO-PYROLYSIS WITH SOLID WASTE

Use: Same as Code 81.

Explanation: Same as Code 86, except if pyroloysis is used with solid waste, only Code 87 need be entered on the EPA-1 form. Appropriate coding must be performed to indicate that this is a multiple-use project.

Notes:

CODE 88 - CO-INCINERATION - OTHERS

Use: Same as Code 81.

Explanation: If any of the incineration processes described in Codes 81, 82, 83, 84, or 85 are used with wastes other than municipal solid wastes (oil refinery sludges, waste oils, etc.), Code 88 should be used in conjunction with Codes 81-85. If this code is used, the type of material which the sludge is being incinerated with should be identified under the Comments on the reverse of the EPA-1 form. Screening for multiple-use purposes should be employed.

Notes:

DISPOSAL

CODE 89 - LANDFILL

Use: To dispose of solid and semi-solid waste products from any wastewater treatment plant.

Explanation: A sanitary landfill in conjunction with municipal refuse is often used to dispose of treated sludge from wastewater treatment plants. These include the materials from the bar screens, grit chamber, ash from incineration, dewatered sludges, etc.

Notes:

CODE 90 - LAND SPREADING OR LAND APPLICATION OF LIQUID SLUDGE

Use: To dispose of sludge.

Explanation: Liquid sludges - sludges discharged directly from sedimentation tanks without thickening, dewatering or reduction phases - are spread on land or plowed into the land for ultimate disposal. Although all types of sludges have been disposed of by this method, the most predominate type of sludge is from activated sludge plants.

Notes:

CODE 91 - LAND SPREADING OR LAND APPLICATION OF THICKENED SLUDGE

Use: Same as Code 90.

Explanation: All factors are the same for spreading of thickened sludge as liquid sludge except that if Code 91 is used, one of the thickening steps must also be included in this category - Codes 75, 76, 77, 78, 79, or 80.

Notes:

CODE 92 - TRENCHING

Use: To dispose of liquid, thickened, dewatered, or incinerated sludges and residues.

Explanation: Trenches are cut into the land and the sludges are placed into them and backfilled. Any type of sludge can be disposed in this manner, but a thickened or dewatered sludge, or the ash from various incineration processes will be prevalent.

Notes:

CODE 93 - OCEAN DUMPING

Use: To dispose of various sludges.

Explanation: Ocean dumping is used in a number of coastal cities, almost all of which are on the Atlantic coast. Barges take the sludge to specified areas offshore and dump the sludge on a routine basis. This method of disposing of sludge is now illegal and only existing facilities should specify it as a present use. Future use is not allowed.

Notes:

CODE 94 - OTHER SLUDGE HANDLING

Use: To ultimately dispose of any or all sludges or residues not classified by individual codes above.

Explanation: When this code is used, a comment should be made on the reverse of the EPA-1 form specifying actual process. Screening for multiple-use purposes should be employed.

Notes:

CODE 95 - DIGEST GAS UTILIZATION FACILITIES

Use: To take advantage of the methane gas produced during anaerobic digestion processes.

Explanation: Code 95 should only be used in conjunction with Code 68 (Anaerobic Digestion). One of the by-products of anaerobic digestion is methane gas. Many larger facilities utilize this methane gas for production of power to drive many pumps and other machines and to fuel boilers for heating of buildings, etc. This code will only be used for large plants which have actually installed the facilities to capture this methane gas.

Notes:

MISCELLANEOUS

CODE 96 - CONTROL/LAB/MAINTENANCE BUILDINGS

Use: To identify if the treatment plant has laboratories, offices, etc. on site.

Explanation: Most plants larger than 5.0 MGD will use this code because these facilities are necessary for day-to-day operation.

Notes:

CODE 97 - FULLY AUTOMATED USING DIGITAL CONTROLS (COMPUTER)

Use: This code or the two following ones (98 and 99) should be used on all automated treatment plants. They identify the type of control and degree of automation for the operation of the treatment plant in question. It is possible that more than one code may be used where an older secondary treatment plant is manually operated, while a more recently constructed AWT process has been installed and is fully automated.

Notes:

CODE 98 - FULLY AUTOMATED USING ANALOG CONTROLS

Use: Same as Code 97.

Explanation: This is the same as Code 97 except an analog computer is used for control purposes rather than a digital computer.

Notes:

CODE 99 - SEMI-AUTOMATED PLANT

Use: Same as Code 97.

Explanation: The plants under this code have some automation, for instance, pumping cycles, etc., but the degree of automation is very small as compared to Codes 97 and 98.

Notes:

CODE A1 - MANUALLY OPERATED AND CONTROLLED PLANT

Use: Same as Code 97, 98, and 99.

Explanation: This is a treatment plant with no automation whatsoever. All controls are done manually.

Notes:

CODE A2 - PACKAGE PLANT

Use: This code and A3 and A4 signify the type of construction used to build the plant.

Explanation: Package plants are generally small plants whose design capacity is less than 200,000 gallons per day. This code signifies that the major units of the plant, excluding foundations, influent and effluent piping, and control buildings, are premanufactured. The package plant would include a complete plant with all aerators, etc. and the so-called field erected plants, which are completely fabricated elsewhere and put together on the site.

Notes:

CODE A3 - SEMI-PACKAGE PLANT

Use: Same as Code A2.

Explanation: Semi-package plant signifies that some unit processes are "off-the-shelf" items, such as an AWT process. This code should not be used unless a complete process arrives at the site, as defined under Code A2, or unless the total plant has components of which at least 50 percent are off-the-shelf items.

Notes:

CODE A4 - CUSTOM BUILT PLANT

Use: Same as Code A2.

Explanation: A custom built plant is one where all the tankage and unit processes are made as individual items on site, such as poured-in-place concrete settling and aeration tanks, digestors, or other facilities. Most plants 1.0 MGD or greater will fall into this category.

Notes: